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Early Childhood Education and Care
Productivity Commission
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Productivity Commission Inquiry into Early Childhood Education and Care – Draft Report

Dear Commissioner Gropp, Commissioner Stokie and Associate Commissioner Brennan

Questacon acknowledges that the formal period for submission to the Productivity Commission inquiry into early childhood education and care (ECEC) draft report – *A path to universal early childhood education and care* has now closed, but appreciates advice provided by Assistant Commissioner for the Inquiry and Research Group, Miriam Veismen-Apter that the Group would be open to receiving a response from Questacon.

Questacon – The National Science and Technology Centre is Australia’s national science engagement organisation. It is a division of the Department of Industry, Science and Resources and is an informal learning institution which offers the opportunity for Australians to participate in science, technology, engineering and mathematics (STEM) through accessible and engaging, hands-on approaches. For more than 35 years, Questacon has delivered informal learning experiences which complement and enrich the Australian Curriculum and make scientific and mathematical concepts more accessible to communities in regional, rural and remote areas of Australia.

Questacon is focused on supporting young people to develop the attributes, skills, knowledge and agency to thrive in tomorrow’s world. Literacy and numeracy are key enablers for young people to build these future skills.

Early childhood marks a critical developmental stage where neural connections are rapidly formed, shaping lifelong learning trajectories. It is within this period that the foundations for cognitive skills, problem-solving abilities, and socio-emotional competencies are laid. The imperative of engaging early learners in Science, Technology, Engineering, and Mathematics (STEM) during this foundational time has profound implications for children’s development and societal progress.

Questacon’s 20-year vision is to inspire Australians with science and technology and the opportunities it creates for the future. The foundations to diverse participation in STEM start

in early childhood and we support any initiatives by the Productivity Commission which enrich these years for children and their carers.

The need for STEM education as a fundamental part of early childhood education was identified and reiterated in the National Innovation and Science Agenda - *Evaluation of Early Learning and Schools Initiatives*:

“Governments across Australia recognise the importance of high-quality STEM education to the nation’s current and future economic productivity and wellbeing. Today’s pre-schoolers will be employed in jobs yet to be created and face enormous social, economic and environmental challenges with technologies yet to be imagined. A strong STEM education is integral in preparing students for these changes by building students’ skills in critical and creative thinking, problem solving, analysing and communicating quantitative data. These skills enable students to think adaptively and access a range of careers. The best investment in STEM education starts in the early years” (Dandolo Partners, 2020)

The case for supporting early childhood STEM education is underpinned by immediate and long lasting benefits. These advantages can be broadly categorised into three key areas;

1. STEM identity formation

The early years represent a critical period for the development of STEM identity, encompassing children’s perceptions of themselves as capable STEM learners. Research indicates that early exposure to STEM experiences positively influences children’s attitudes and beliefs about their STEM abilities (Hachey, 2020). By fostering a sense of belonging and competence in STEM, early childhood programs play a pivotal role in shaping future STEM engagement and career aspirations.

Questacon’s early learning offerings are underpinned by the pedagogical approach of developing positive attitudes and behaviours and empowering children to hold STEM identities.

2. Addressing stereotypes and increasing diversity in STEM

Early childhood STEM education offers a unique opportunity to challenge stereotypes and promote inclusivity in STEM fields.

Research has shown a trend where children as young as 3 years of age begin to internalise and manifest biases that align STEM professions and math ability more closely with boys (Mulvey & Irvin, 2018; Cvencek et al, 2011). This early onset of stereotyping is particularly damaging considering there is no notion of inherent gender differences and math abilities (Lindberg, Hyde & Petersen, 2010)), and perpetuation of these stereotypes undermines the potential of girls to contribute to STEM fields long term.

Early Learning STEM programs can address and challenge stereotypes about who is and who could be good at STEM from an early age and can increase motivation and engagement in STEM for girls and minority groups, leading to an increased diversity in children going on

to further study and STEM careers (McGuire *et al.*, 2020). By providing equitable access to STEM opportunities, early childhood programs contribute to creating a more inclusive and diverse STEM workforce.

3. Long-term outcomes

The STEM capacities developed during early childhood serve as the building blocks for future success across academic achievement, economic productivity, and societal well-being. The positive impacts of investing in early learning are significant and two-fold. Firstly, they include broad community outcomes through the development of healthy, educated, engaged and contributing members of society. Secondly, they directly relate to the educational success of primary and secondary school children who have had the benefit of early years' investment. Once a child's trajectories for well-being, learning, behaviour and social development are established in early childhood, changing their course "takes more resources, more time and is potentially less effective" (Ainley *et al.*, 2010). As such, economic returns on initial investments are much higher in the early years than when children are older.

Provided below is a summary of STEM early learning offerings across Questacon and Australia. It is supported by relevant publications that provide additional insights and evidence as to the significant importance of STEM education in preparing our youngest Australians for the skills they will need to solve future challenges.

We hope that this information may be a useful contribution to the review, and welcome further discussion on the content.

Sincerely,

Jo White
Director, Questacon

Supporting Documentation

1. Questacon Early Learning Offerings

Questacon's suite of targeted Early Learning STEM programs represent a commitment to nurturing early scientific curiosity and engagement among children, their carers, and educators. The popularity of these programs, underscored by significant repeat visitation and strong community relationships, highlights their impact and effectiveness in the early learning space.

Science Time

Science Time is a hallmark program encapsulating Questacon's innovative approach to early childhood education. Designed for children aged 3-5 years and their carers, these 45-minute workshops emphasise carer-child collaborative exploration of scientific concepts and aim to build STEM identity and capacity. Each session, structured around carpet time and hands-on experiments focuses on a unique scientific concept, engaging children and adults in shared learning experiences. The program's growth attests to its success and community demand with over 3,000 families participating over 12 years.

Evaluative studies of Science Time underscore its efficacy in enhancing children's curiosity and engagement in STEM fields. Notably, after undertaking a Science Time workshop children were more likely to ask STEM related questions and engage with carers on STEM topics. Children also reported a marked change in attitude after participating in Science Time; they reported a change in attitude and willingness to engage in scientific exploration after the workshop. Additionally, the program bolstered carers' confidence and ability to facilitate science learning at home, underlining the dual benefit of the initiative.

Mini Q

Mini Q represents a bespoke environment tailored to the developmental needs of children aged 0-6 years. This permanent exhibition is segmented into zones designed to stimulate educational play across various developmental stages and encourage STEM habits of mind. By encouraging observation, prediction, testing, and refining processes as well as tool use decoding and spatial awareness, Mini Q not only fosters scientific learning and skills development but also nurtures imagination and confidence among its young attendees. The provision of written resources for parents and educators further extends the learning experience beyond the physical space of Questacon and builds the STEM confidence of carers.

Following recommendations from an independent evaluation by Community Early Learning Australia a Calm Space was introduced within MiniQ in 2023, marking a pivotal advancement in inclusive early childhood STEM education. This specially designed area caters to the needs of neurodivergent children, providing an environment they can retreat from sensory overload.

In 2025 MiniQ will undergo a further physical update which will reimagine how early childhood STEM education can be delivered to cater to the needs of all learners. This new refresh will incorporate up-to-date child development research and embrace principles of inclusivity and accessibility to encourage child-led exploration.

Little Explorers' Days

Launched in 2018, Little Explorers' Days offer dedicated time slots across select days for the 0-6 age group at the Questacon Centre in Canberra. The aim is to attract young visitors and their carers to the Questacon Centre to build inquiring minds and spark an interest in STEM. The program offers a range of activities and shows tailored to early learners which are designed to ignite curiosity, hands-on learning and most of all play. This initiative has evolved in response to feedback, with adjustments in visitor numbers and activity offerings to enhance the overall experience. In 2024 Little Explorers' Days saw 2,393 children and their families participating in the activities.

Additional Early Learner Programs at Questacon

In addition to these initiatives Questacon has broadened its educational reach through a variety of programs tailored to early learners both in-centre and through our national programs including;

Puppet shows merge the art of storytelling with scientific inquiry, creating a captivating educational experience for early learners. These shows feature characters and narratives that weave in scientific themes and make abstract concepts tangible for young audiences.

Interactive Adventures such as the Butterfly Adventure offer children aged 3-6 years an immersive experience. Through role play, young learners embark on journeys to nurture curiosity and an understanding of the natural world.

Science Circus Tot Spot is designed specifically for toddlers. Part of the wider Science Circus outreach initiative, the Tot Spot brings hands-on scientific exploration directly to Australia's youngest learners in rural, regional and remote regions.

Educator Programs recognise the pivotal role educators play in early childhood development. Questacon offers specialised training programs aimed at enhancing the STEM teaching skills of early childhood educators.

Digital Offerings include **Science Time at Home** and **Early Learning Adventures** in Science for 3-6 year olds to extend child engagement and provide at home activities designed for family participation.

2. Overview of Other National STEM Programs for Early Childhood

Little Scientists stands out as a professional development program for early childhood educators, aiming to embed inquiry-based STEM learning into early childhood education. It is

a cornerstone for educator empowerment in STEM, acknowledging the critical role of teachers in sparking early scientific curiosity.

Early Learning STEM Australia (ELSA) innovatively combines digital learning with play-based education, reflecting a modern approach to early STEM engagement. It addresses the growing need for digital literacy alongside scientific inquiry.

Children's Discovery and Little Bang initiatives provide direct engagement with STEM based knowledge and skills for early learners through workshops and activities. These programs prioritise hands-on learning with carers and work through existing networks such as libraries, schools and out of school hours care providers.

Fizzics Education brings science workshops to early learners, making it a key player in direct STEM engagement. It transforms the abstract into the tangible, serving as a bridge between academic concepts and real-world application.

Early Start Discovery Space provides a museum-based interactive learning experience, unique in its immersive approach to early STEM education. It is an invaluable resource for experiential learning for 0-10 year olds.

3. Reference List

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