

– Joint Position Statement on –

EARLY CHILDHOOD STEM EDUCATION

This Position Statement has been co-developed by Charles Sturt University's STEM Education Research Group, and Little Scientists Australia, an initiative of FROEBEL Australia. Together, we have taken actions to foster effective early childhood STEM education through our research, advocacy, and professional engagement. Through this Position Statement, we give recognition to the importance of inquiry-based STEM exploration in early childhood education and highlight the critical foundations it provides for children's STEM learning journeys, lifelong curiosity, and appreciation for STEM. This Position Statement recommends meaningful actions for early childhood educators, service managers, and policy makers to support the provision of high-quality, evidence-based STEM education opportunities in early childhood.



RATIONALE

In essence, STEM is about awe and wonder, and using the knowledge and processes of science, technology, engineering, and mathematics to help children and educators pose, ponder, and solve problems that are meaningful to their worlds and contextsⁱ.

Research suggests that the early childhood years (birth to 8 years of age) lay the foundation for future learning in STEMⁱⁱ. Early, meaningful experiences of science have been found to enhance children's belief in their ability to learnⁱⁱⁱ, and such experiences trigger an appreciation for science and its value to everyday life^{iv}. Similarly, the mathematical skills developed at an early age are strong predictors of later academic success^v. Early STEM education supports children on a journey towards STEM opportunities in their futures.

Studies have also shown that early childhood environments are rich in opportunities for discovery and research, and that science, mathematics, engineering or technologies can be naturally integrated through the activity of the child^{vi}. However, some early childhood educators experience uncertainty in relation to STEM content^{vi}, and this can impact their confidence in STEM education. Educator participation in high-quality, sustained STEM professional learning has been found to promote positive attitudes and increase confidence in STEM education^{vii} ^{viii}.



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OUR POSITION

STEM EDUCATION BEGINS IN EARLY CHILDHOOD

If you want to know how to “do STEM”, look at our youngest children. Every day, young children are curious, creative, and do not hesitate to try things out. They notice things, wonder about them, and explore. They ask questions, investigate, and seek to understand. They use their own capacities in resourceful ways, and they are not afraid to call upon the resourcefulness of others when they need help, or when they want to share curiosities and discoveries with othersⁱ. We believe that to discover the wonders of STEM, children need to be given the opportunity to explore the world in a nurturing and playful environment that scaffolds their eagerness to learn^{ix}.

STEM EDUCATION SHOULD TAKE ITS LEAD FROM EARLY CHILDHOOD EDUCATION

STEM education should not be seen as an add-on to early childhood education. It is our position that effective STEM education is, at its core, about integrating curriculum areas in meaningful ways – something early childhood educators have always done well, through their emphasis on child-led play, inquiry and investigationⁱ. We believe that early childhood educators are our original leaders of integrated curriculum approaches such as STEM^{viii}.

i The Sector, “In conversation with Associate Professor Amy MacDonald, ECEC STEM researcher”, 4 December 2019. <https://thesector.com.au/2019/12/04/in-conversation-with-associate-professor-amy-macdonald-ecec-stem-researcher/>

ii Campbell, C., Speldewinde, C., Howitt, C., & MacDonald, A. (2018). STEM practice in the early years. *Creative Education*, 9(1), 11–25.

iii Patrick, H., Mantzicopoulos, P., & Samarapungavan, A. (2009). Motivation for learning science in Kindergarten: Is there a gender gap and does integrated inquiry and literacy instruction make a difference. *Journal of Research in Science Teaching*, 46(2), 166–191.

iv Fleer, M., March, S., & Gunstone, D. (2006). Investigations into the engagement of preschool and primary aged children in science, engineering and technology. Monash University.

v Duncan, G. J., C. J. Dowsett, A. Claessens, K. Magnuson, A. C. Huston, P. Klebanov, L. S. Pagani, et al. (2007). School readiness and later achievement. *Developmental Psychology*, 43(6), 1428–1446.

vi Cohrssen, C., & Page, J. (2016). Articulating a rights-based argument for mathematics teaching and learning in early childhood education. *Australasian Journal of Early Childhood*, 41(3), 104–108

vii Alexander, C., Knezek, G., Christensen, R., Tyler-Wood, T., & Bull, G. (2014). The impact of project-based learning on pre-service teachers' technology attitudes and skills. *Journal of Computers in Mathematics & Science Teaching*, 33(3), 257–282.

viii Bers, M. U., Seddighin, S., & Sullivan, A. (2013). Ready for robotics: Bringing together the T and E of STEM in early childhood teacher education. *Journal of Technology and Teacher Education*, 21(3), 355–377.

ix Little Scientists Australia. (2020). About Little Scientists. <https://littlescientists.org.au/about/>

RECOMMENDATIONS

▶▶▶▶ OUR ADVICE TO EARLY CHILDHOOD EDUCATORS

- ▶ Take guidance from children's cues and questions. Support children to be "problem posers" as well as "problem solvers".
- ▶ It's not only ok—but great!—to "not know". "Not knowing" opens up possibilities for exploring and learning collaboratively with children.
- ▶ Many children delight in "big words" and technical terms. Feel confident to use these terms to help children understand and label what they are noticing and experiencing.
- ▶ Proudly make use of your everyday resources for STEM education. Recycle, repurpose, adapt, and create your own resources.
- ▶ If you have access to formal tools and equipment for STEM, have confidence in children's ability to use these, both in "technically correct" ways and for their own purposes.

▶▶▶▶ OUR ADVICE TO EARLY CHILDHOOD SERVICE MANAGERS

- ▶ Provide your educators with access to regular, high-quality STEM professional learning. Some educators need a bit of guidance to see how STEM is part of their everyday practice, and most thrive when given the opportunity to share their STEM practices with others.
- ▶ Involve families in everyday STEM explorations. Invite parents and caregivers to continue investigations at home, to listen to children's ideas, and to go through the recycling bin to look for materials to use for STEM learning. The bigger the group of researchers, the better!

▶▶▶▶ OUR ADVICE TO EARLY CHILDHOOD POLICY MAKERS

- ▶ Provide sustained funding for high-quality early childhood STEM initiatives. Research shows that early positive outcomes in STEM enhance children's STEM achievement at school and later in life.
- ▶ Dedicate funding for research that promotes high-quality STEM education in early childhood. Continuous improvement requires meaningful evidence and responsiveness to current educational contexts.

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