



# MINERALS COUNCIL OF AUSTRALIA

## DISCUSSION PAPER: WOMEN IN STEM DECADAL PLAN

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## EXECUTIVE SUMMARY

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The Minerals Council of Australia (MCA) appreciates the opportunity to comment on the Women in STEM Decadal Plan [discussion paper](#).

The Australian minerals industry is committed to supporting workforce diversity and inclusion, recognising the benefits of diversity for business and society. This includes a long-standing commitment and action to increase female participation.

Australia's minerals industry is sophisticated and technologically sophisticated due to it having and requiring a highly skilled and adaptable workforce. The pace of technological change within industry is already apparent, with technologies such as automation, robotics and big data being used across the minerals value chain to enhance workplace health and safety, increase productivity and reduce risk.<sup>1</sup> Big data refers to the '...high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight, decision making, and process optimisation.'<sup>2</sup>

The broader skills and capabilities important to the future minerals workforce include core technical skills coupled with cognitive (or 'soft skills') and interpersonal skills as well as specialist skills in complementary disciplines.<sup>3</sup> As industry prepares for this future and companies further embed digital thinking into strategy and practice, science-based skills are becoming even more critical for the industry's pioneers and innovators of tomorrow.<sup>4</sup>

Science, technology, engineering and mathematics (STEM) skills have been identified as critically important to live and work in a globalised world, providing the necessary knowledge to solve real-world challenges and address complex problems.<sup>5</sup> In today's global economy, which is increasingly driven by data, digital technologies and innovation, the profile of the future worker is also transforming, with an estimated 70 per cent of future jobs anticipated to be STEM related.<sup>6</sup>

There are concerns regarding the current and future supply of adequate STEM skills for Australian businesses, and the marked decline in participation in STEM subjects in schools over the last decade is alarming.<sup>7</sup> Notably, a significant gap persists in women's participation and tertiary enrolments in STEM studies, with only 16 per cent of university and vocational education and training STEM graduates being female.<sup>8</sup> The underrepresentation of women in STEM is globally pervasive; for example, even though globally women represent the majority of university graduates they still represent a minority of STEM graduates.<sup>9</sup>

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<sup>1</sup> Deloitte Access Economics, [Tracking the Trends 2018: the top 10 issues shaping mining in the year ahead](#), 2018, page 4; and Minerals Council of Australia, [Submission to Senate Select Committee on the Future of Work and Workers Inquiry](#), January 2018, page 19.

<sup>2</sup> Gartner IT, [The Importance of 'Big Data': A Definition](#), IT Glossary, online resource viewed 5 October 2018; and Australian Public Service, [Big Data Strategy](#), Commonwealth of Australia 2013, p. 8, viewed 5 October 2018.

<sup>3</sup> Productivity Commission, [Shifting the Dial: 5 Year Productivity Review](#), Report No. 84, Canberra, 3 August 2017, pp. 83-84.

<sup>4</sup> Deloitte Access Economics, [Tracking the Trends 2018: the top 10 issues shaping mining in the year ahead](#), 2018, p. 4; and Productivity Commission, [Shifting the Dial: 5 Year Productivity Review](#), Report No. 84, Canberra, 3 August 2017, pp. 83-84.

<sup>5</sup> Department of Education and Training, [Support for Science, Technology, Engineering and Mathematics \(STEM\)](#), Australian Curriculum web page, Australian Government, 23 April 2018, viewed 27 September 2018.

<sup>6</sup> Pricewaterhouse Cooper, [A Smart Move: Future-proofing Australia's workforce by growing skills in science, technology, engineering and maths \(STEM\)](#), April 2015, page 14. As referenced in [www.riotinto.com/ourcommitment/spotlight-18130\\_22976.aspx](#).

<sup>7</sup> Minerals Council of Australia, [Submission to Senate Select Committee on the Future of Work and Workers Inquiry](#), January 2018, page 10.

<sup>8</sup> Australian Government Office of the Chief Scientist, [Busting Myths about Women in STEM](#) occasional paper and [Women in STEM – a story of attrition](#) occasional paper and data sheet, Australian Government 2016.

<sup>9</sup> United Nations Educational, Scientific and Cultural Organization, [Global Education Monitoring Report Accountability in Education: Meeting our Commitments](#), ISBN: 978-92-3-100239-7 – licensed under the Attribution-ShareAlike 3.0 IGO (CC-BY-SA 3.0 IGO), viewed 27 September 2018.

## DECONSTRUCTING THE ACRONYM – PERCEPTION AND OPPORTUNITY

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It is often said that STEM refers collectively to a broad field of distinct and complementary approaches to knowledge; a way of thinking or a framework in which problems can be tackled - using the skills required to learn science, technology and mathematics, and how engineering and design processes and principles are used to achieve an outcome.<sup>10</sup>

However it may be problematic that this well-known acronym is being colloquially used as a word. This misrepresents the breadth of experience and motivations for entering into various fields and the opportunities they present, creating a superficial but powerful barrier to securing the different skills and individuals required for the future workforce.<sup>11</sup> It also minimises the importance of each discipline in its own right and its role in enabling discovery and progress in other fields.<sup>12</sup>

The MCA understands that although people are aware of the minerals industry, knowledge about the industry is low, evidenced by misconceptions of industry and findings of student perceptions research conducted in 2018.<sup>13</sup> Lack of awareness contributes to low enrolments and the dwindling pipeline for the future minerals workforce. This is also reflected across the broader STEM workforce

A clearer and more accurate narrative needs to be established and employed for STEM, focused on the framework or approaches to thinking it offers. This includes the ability to define and respond to problems, the range of skills it equips learners with, and the opportunities and pathways it presents.

Opportunities exist for industries, governments, the education sector and other partners to work collaboratively to support better understanding of STEM and the higher education and vocational career pathways available throughout the entire learning lifecycle, inclusive of primary and secondary education.

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<sup>10</sup> Office of the Chief Scientist 2014, *Science, Technology, Engineering and Mathematics: Australia's Future*, Australian Government, Canberra, p. 34; Byron Scaf, [STEM – We know what it stands for but what does it mean?](#) *Community Contribution*, EducationHQ Australia; and Dr L Pfeiffer, [Explainer: STEM, and what it means to Australia's education system](#), The Sydney Morning Herald, 5 January 2017.

<sup>11</sup> E Huntington E, 'Preparing for the future minerals workforce – now!', address at the Minerals Council of Australia 2018 Minerals Industry Education Summit, Melbourne, 17 May 2018; and K Andrews, 'VET a key to the future of Australian mining industry', address at the MCA 2018 Minerals Industry Education Summit, Melbourne, 17 May 2018.

<sup>12</sup> Ibid.

<sup>13</sup> Minerals Council of Australia, AusIMM and METS Ignited, [Australian Mining sector must work hard to promote industry careers](#), Media Release, 17 May 2018.

## DIVERSITY

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In seeking to increase women's participation in STEM, it is important to consider both how to attract the new pipeline of STEM professionals *and* retain the existing talent. Some studies link the high attrition rates of women in STEM to gender pay gaps, lack of career advancement and culture.<sup>14</sup>

It is important to consider the relationship between broader diversification and how it impacts culture and perception. Analysis of the intersection between gender and other social identifiers is required to help to define the breadth of interventions, promotions and standards required to capture and retain the diversity sought which is essential to the future STEM workforce across industries. Key social identifiers include age, ethnicity, mental and/or physical ability, ethnicity, sexual orientation, socioeconomic status, geographic background, language, familial composition, educational background, academic and social achievement, self-image, and social, political and religious beliefs.<sup>15</sup>

Overall, the disconnect between policy position, intent and practice across the STEM workforce needs to be holistically addressed through more formal frameworks to support and facilitate diversity and responding to the barriers to participation and ongoing engagement in STEM.<sup>16</sup> The minerals industry would welcome the opportunity to further contribute to this work.

Stabilisation of policy positioning, intent and practice in relation to diversity and discrimination would enable the exploration of alternative models of engagement, participation and retention. For example, shifting focus away from social identifiers and occupations towards skills –and interests. Such an approach would require mapping of skills and pathways across the spectrum of STEM-related opportunities.

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<sup>14</sup> Professionals Australia, [All talk: Gap between policy and practice a key obstacle to gender equity in STEM – 2018 women in STEM professions survey report](#), 2018, ISSN 1834-6545 (Online) viewed 4 October 2018, pp. 6, 11 17, 33. 39-40.

<sup>15</sup> Independent School Diversity Network, [What is Diversity](#), online resource, viewed 4 October 2018.

<sup>16</sup> Above n14, pp. 6, 11 17.

## MENTORING

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Mentoring programs and workshops play an important role in recruiting and retaining women and other diverse cohorts in STEM fields. The power of mentoring is its ability to provide a lived representation of what it is like to work in STEM.<sup>17</sup> This is further enhanced through providing a mentor someone is able to identify with. It also provides a trusted space for the someone to discuss and resolve challenges and identify new opportunities.

Mentoring options benefit from diversity in audience and frame, including school-aged students interested in STEM, tertiary students studying STEM and professionals working in STEM. There is also scope to integrate the benefits and opportunities of STEM in more generic mentoring programs once a stronger societal STEM narrative is established.

Traditional mentoring programs and workshops provide a positive, structured platform for recruitment and retention of STEM talent however they are often time-restricted, resource intensive and selective and require complimentary options to expand accessibility and exposure. For example, initiatives that support and recognise alternative mentoring practices and promote the benefits and influence of informal and incidental mentoring, as well as peer-to-peer support and development.

### **Promoting science, technology, engineering and maths disciplines and opportunities**

Australia's minerals industry proactively supports STEM promotion through outreach initiatives.

In addition to the more than \$50 million of direct investment in higher education through the [Minerals Tertiary Education Council](#), the industry also supports established programs that increase awareness of an interest in careers in the industry including workshops, peer-to-peer outreach programs, teacher professional development and online resources for teachers.<sup>18</sup>

The MCA complements company-led and supported initiatives by providing additional support to STEM initiatives focused on girls and Indigenous students. These initiatives include:

- The [Aurora Education Foundation](#) – inspiring the academic and career aspirations and achievements of Aboriginal and Torres Strait Islander people through programs such as [The Aspiration Initiative](#)
- [Robogals Asia Pacific](#) – inspiring girls about career pathways in engineering through workshops and science challenges, as well as peer-to-peer development opportunities for women in science. A key investment for industry is the rural trips program that delivers targeted workshops in rural and regional Australia
- The national [Teacher Earth Science Education Program](#) – developing science teachers through nine professional development modules as well online resources and minerals kits provided at no-cost.
- [OresomeResources](#) - Fully funded and managed by industry, provides free online educational resources and teacher professional development to assist the teaching and learning of minerals and energy

Encouraging and building the supply side of critical STEM skills and connecting emerging talent in schools, universities and TAFE with what a career in the Australian mining sector looks like is important to the future minerals workforce.<sup>19</sup>

The minerals industry supports the implementation of a considered, collaborative and strategic Decadal Plan for Women in STEM and seeing tangible initiatives and investment across government and the STEM sector to prepare for and secure the future pipeline of workers. The MCA looks forward to continuing to engage with the education sector, governments and other partners on this critical matter.

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<sup>17</sup> [Industry Mentoring Network in STEM](#); [Curious Minds Program](#); and; Media Planet, [How the art of mentoring is helping women excel in STEM fields](#), Education and Career News, America viewed 4 October 2018.

<sup>18</sup> Minerals Council of Australia, [Submission to Optimising STEM Industry-School Partnerships: Inspiring Australia's Next Generation issues paper](#) February 2018, page 6.

<sup>19</sup> N Firth, 'Preparing for the workforce of the future', address at the Minerals Council of Australia 2018 Minerals Industry Education Summit, Melbourne, 17 May 2018.