



State STEM Strategy

Department of Jobs, Tourism, Science and Innovation

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About CME

The Chamber of Minerals and Energy of Western Australia (CME) is the peak resources sector representative body in Western Australia. CME is funded by its member companies who are responsible for most of the State's mineral and energy production and are major employers of the resources sector workforce in the State.

In 2015-16, the value of Western Australia's mineral and petroleum production was \$88 billion. Iron ore is currently the State's most valuable commodity, accounting for more than half the State's production value at \$48 billion. Petroleum products (including LNG, crude oil and condensate) follow at \$18.4 billion, with gold third at \$10 billion.

The sector is a major contributor to the state and the Australian economy. The estimated value of royalties the state received from the resources sector composed almost 34.8 per cent of estimated total state revenue in 2015-16, or around \$4.7billion.

Context

The importance of the uptake of Science, Technology, Engineering and Maths (STEM) subjects for school students and the core competencies provided by STEM subjects, including critical thinking, problem solving, creativity, and rigorous evaluation has been well-documented in recent years and will grow to become even more important as the Australian economy continues its transition to a knowledge-based, high skilled economy. Research suggests 75 per cent of the fastest growing occupations now require STEM skills and knowledge.

For the resources sector, it has been well-documented automation and the move to other higher technologies will affect vocational education and training roles, and the professional disciplines from a STEM skills perspective.

This future need is against a backdrop of declining STEM achievement in schools. Over the last decade or more school standards in STEM have fallen, in both relative and absolute terms. This decline has occurred at a time when Australia's international competitors, especially within the Asian region, have placed increasing emphasis on STEM education and are achieving higher standards.

From collated anecdotal views of school educators, university lecturers, vocational educators and employers; and empirical studies including international and national educational testing programs and research, the view is consistent - a substantial improvement in STEM uptake and achievement from the school education system is urgently required if Australia is to become a pre-eminent jurisdiction for STEM schooling outcomes. This will in turn impact the quality of entrants into vocational education and training programs and higher education courses, which, the resources industry will be even more reliant on into the future.

The Minister for Science and Innovation, the Hon. Dave Kelly MLA, appointed a STEM Advisory Panel on 8 June 2017 to develop a comprehensive State STEM Strategy by 31 March 2018.

At its meeting on that date the STEM Advisory Panel asked the Department of Jobs, Tourism, Science and Innovation (JTSI) to create a framework for a State STEM Strategy.

The STEM strategy will initially map Western Australia's STEM workforce, highlighting strengths and gaps in skills and expertise. It will then identify STEM growth industries with a vision to grow the local workforce. Ultimately the State STEM Strategy will provide government with some options in considering short, medium and long-term planning, policy and investment to address the issue.

JTSI has called for substantive input and feedback from relevant industries to incorporate into the framework. This submission will provide feedback from the WA resources sector to input into the WA State STEM Strategy.

Industry Feedback on the State STEM Strategy

CME appreciates to opportunity to provide industry feedback to support the development of a State STEM Strategy. JTSI invited CME's involvement in the consultation process, including a face to face meeting and input into the strategy framework template. The resources sector is a leader in STEM and has a number of best practice initiatives already in place to build the STEM capability of students and their own local workforce.

CME appreciates the Western Australian Government is taking action in an area the resources industry has long identified as requiring a clear strategy with collaboration between the government, industry and the education and training sectors.

CME recommends consideration of the following input from the Western Australian resources sector to inform the development of the State STEM Strategy. In addition to the consideration of industry feedback, CME recommends the State STEM Strategy includes a clear commitment and plan to implement the strategy in the short, medium and long term.

Industry Strategy Framework

Challenge To build State STEM skills to meet the needs of WA's future workforce and capitalise on the creation of job opportunities.

Goal Enhanced source of professional, para-professional, trade and skilled graduates qualified in relevant areas of STEM.

Challenge Elements	Strategies	Actions and programs
Attracting a STEM capable workforce and understanding STEM related career pathways in the industry	Partnerships between industry and schools/ tertiary institutions	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • Chevron's Women in Engineering program • CME's Inspiring Girls initiative • WA School of Mines Focus on Mining Camps • Careers programs in schools • Apprenticeship and traineeship programs • Petroleum Club Next Generation program
	Community engagement	<ul style="list-style-type: none"> • Mine site tours • Woodside Technology and Science Collaboration • CodaDojo • Community engagement programs
	Mentoring programs between industry and university students in STEM courses	<ul style="list-style-type: none"> • Rio Tinto & UWA Women in Engineering mentoring program • CodaDojo
	Increase vacation and graduate placements and traineeships and apprenticeships	<ul style="list-style-type: none"> • Rio Tinto and BHP recently announced they will be increasing apprenticeships, traineeships, vacation and graduate placements • Vacation and cadetship programs
	Industry workforce actively engaged in outreach activities with students	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • Women in Mining and Resources WA school speakers program • CME's Inspiring Girls initiative • Trade Up (Women in Trades) • Petroleum Club Next Generation program • Better utilise existing school IT systems to connect classrooms with industry via Skype/video-conferencing etc

Challenge Elements	Strategies	Actions and programs
	Profiling industry STEM careers (role modelling) to students	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • Women in Mining and Resources WA school speakers program • CME's Inspiring Girls initiative • Trade Up (Women in Trades) • Petroleum Club Next Generation program
	Industry sponsorship of STEM programs and initiatives	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • CME's Inspiring Girls initiative • RoboGals
Attracting a diverse STEM capable workforce (Gender, regional, Indigenous, Low socio-economic)	Partnerships between industry and schools/ tertiary institutions	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • CME's Inspiring Girls initiative • WA School of Mines Focus on Mining Camps (including girls only camp)
	Community engagement	<ul style="list-style-type: none"> • Mine site tours • Community engagement programs • Woodside Technology and Science Collaboration • CodaDojo
	Scholarships for females, regional students, Indigenous students and students from low-socio economic areas	<ul style="list-style-type: none"> • Resolute Mining Scholarship • Chevron's Women in Engineering Program • Chevron Aboriginal School scholarship program • Aboriginal engagement programs
	Mentoring programs between industry and university students in STEM courses	<ul style="list-style-type: none"> • Rio Tinto & UWA Women in Engineering mentoring program • Girls only CodaDojo
	Industry workforce actively engaged in outreach activities with students	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • Women in Mining and Resources WA school speakers program • CME's Inspiring Girls initiative • Trade Up (Women in Trades)
	Profiling industry STEM careers (role modelling) to students	<ul style="list-style-type: none"> • <i>Get into Resources</i> career days • Women in Mining and Resources WA school speakers program • CME's Inspiring Girls initiative • Trade Up (Women in Trades)

Challenge Elements	Strategies	Actions and programs
	Recruitment strategies to target under-represented groups (women and Indigenous Australians) in STEM roles	<ul style="list-style-type: none"> • Various company advertising campaigns featuring a diverse workforce in STEM related occupations • In regional areas with significant Indigenous communities, actively engage local industry
Incorporating industry related STEM content in school curriculum	Industry sponsorship of STEM programs and initiatives	<ul style="list-style-type: none"> • Earth Science WA • Scitech • Goldfields Education and Mining Industry Alliance
	Have curriculum incorporate WA industrial context, e.g. the science associated with lithium, gold, LNG, iron ore, ammonia etc, is all in the curriculum	<ul style="list-style-type: none"> • Create a portal that lists against relevant curriculum, local industry resources including school visits by industry or excursions to site by student groups
Increasing rate of technological change	Consult with industry to understand contemporary and future industry skills and capability requirements	<ul style="list-style-type: none"> • Resources Industry Training Council
	Collaborative research partnerships with universities and the CSIRO	<ul style="list-style-type: none"> • Industry Mentoring Network In Stem (IMNIS) • Chevron Research Chairs and Curtin, UWA and Murdoch

For additional information of current resources industry related STEM initiatives see appendix 1


Conclusion

The core competencies provided by STEM subjects, including critical thinking, problem solving, creativity, and rigorous evaluation, are increasingly valuable skills. By supporting STEM uptake the resources sector will position the future workforce to be adaptable, flexible, innovative and productive.

Students must be prepared for the jobs of the future, while at the same time industry's local workforce must be retrained and upskilled to adapt to innovations and changing technologies. Ensuring we have a skill ready workforce is critical if we are to capitalise on the emerging knowledge-based and high skilled economy to create local jobs. The development of the State STEM strategy is vital to our future economy.

CME supports the development of the State STEM Strategy and welcomes the recognition of the important contribution the resources sector has in the development of Western Australia's future local workforce. CME recommends the consideration of the feedback provided in this submission to inform the development of the State STEM Strategy and a clear commitment and plan to implement the strategy.

If you have any further queries regarding the above matters, please contact Susan Cull, Manager People and Communities, on (08) 9220 8517 or s.cull@cmewa.com.

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Appendix 1

Science, Technology, Engineering and Mathematics (STEM) Education Initiatives

1. CME – Inspiring Girls Initiative

CME introduced the Inspiring Girls initiative at the 2014 Women in Resources Awards event. In 2017, twenty-three organisations hosted 88 female students and 24 school representatives from 24 schools under the initiative. Inspiring Girls is coordinated through a formal sponsorship arrangement.

The initiative is aimed at inspiring greater numbers of female students to follow in the footsteps of Women in Resources Awards winners. Inspiring Girls provided an opportunity for students to interact with industry representatives.

Inspiring Girls includes attendance for all students, teaching or accompanying school staff, company hosts and Women in Resources Alumni members at CME's Inspiring Girls Careers Forum. This forum is held immediately after the Women in Resources Awards breakfast at the Perth Convention Centre and in 2017 was attended by 125 people.

The forum included a 'speed careering' format, enabling students to rotate through a number of short Q & A sessions with 15 industry representatives on the range of career opportunities in the resources sector. At the same time, teachers were provided with short presentations from 5 organisations providing teachers with information and curriculum resources to enhance their Science, Technology, Engineering and Maths teaching programs. The forum concluded with time for informal networking between students, industry representatives and teachers.

"The year 11 attended the Inspiring Girls Forum on the 3rd of March, 2017. The forum was set in the format of small group discussions, the discussions were arranged in rotations, one of which is similar to speed dating. Because of the "speed-dating" format, we realised the importance of networking and correctly applying communication skills. We met and engaged with different women in varying roles in the resources industry, the stories of these ordinary women was extremely inspiring and encouraging to us. These women introduced themselves, gave us background information into what they studied, their aspirations, anecdotes from their workforce, and their own personal advice, in regards to approaching this industry. Through the interactive discussion, we were able to ask different questions to further expand our knowledge of the opportunities and flexibility of the mining sector, regarding education and experience. The speakers engaged in asking us questions about both our interests and future plans, and provided advice on the most appropriate way of addressing these goals. It was quite an eye-opening experience regarding women in the workforce, as it led us to realise that this preconceived stereotype of women not being capable to participate in such a male dominated sector, was not realistic.

2. Earth Science Western Australia (ESWA)

ESWA is a not-for-profit organisation incorporated in Western Australia for the core purpose of supporting and promoting earth and environmental science education in schools across the State. Winner of the Premier's Science Award – Science Engagement Initiative of the Year 2015. The organisation delivers on its core purpose through the delivery of the following key programs:

- **General ESWA activities:** including incursions, excursions, teacher training and events, supported by a broad range of sponsors;

- **Woodside Australia Science Project (WASP) sponsored by Woodside Energy:** produces support packages for the Earth Science component of the Australian Curriculum. These packages are filled with hands-on activities for students, with teacher support materials. [Teacher professional development](#) sessions can be requested by Western Australian teachers;
- **Primary Australian Literacy Mathematics & Science (PALMS) program sponsored by ConocoPhillips Australia:** which aims to enrich and support the teaching of earth science from Kindergarten to Year 5 across Australia. This will be achieved by providing, within the mandated Earth and Space Science curriculum, hands-on activities integrating aspects of Chemical Sciences, Physical Sciences and Biological Sciences as well as relevant components of English, Mathematics and other subjects into teaching packages that can be easily accessed by teachers of Kindergarten to Year 5. Packages of materials are to be supported with teacher training and hands-on incursions, in Western Australia.

3. The Goldfields Education Mining Industry Alliance (GEMIA) Inc.

GEMIA is a volunteer not-for-profit organisation that works to increase community education and interest in science, technology, engineering and mathematics (STEM) in the goldfields of Western Australia. GEMIA's stakeholders include primary and secondary school students, teachers and community members.

Current work involves:

- Connecting with schools to inspire students to pursue a diverse range of regional STEM professions
- Stimulating scientific curiosity and promoting the mining industry via community projects and events
- Collaborating with partners to progress local opportunities for local people including gender diversity in the workplace
- Developing resources and activities which promote the real world application of scientific concepts

Activities:

- **Teacher's Dust Off:** Dust Off immerses teachers in the world of mining to assist familiarity, build enthusiasm, provide new ideas and establish critical links with the mining sector. Teachers participate in an extended mine site visit with talks by specialists as well as workshop sessions, resources and networking.
- **Girls and Guys Exploring Mining Forum (GGEM):** GGEM is a one-day event for secondary school students offering a unique introduction to mining career and lifestyle opportunities with inspiring speakers, hands-on activities, mine site tours, workshops and career pathway information.
- **Science Rocks on the Road:** Science Rocks on the Road is an outreach program that utilises a trailer equipped with geological resources and activities to schools and communities throughout the region. The program is run by mining volunteers and uses a fun, interactive approach to raise awareness and interest in science and the resources sector.
- **Science after Dark:** Science After Dark is a series of engaging events aimed at people over 18 years of age which encourages debate and discussion on current and

controversial science topics. The inaugural Science After Dark 'Fermented Fashion' event was held in November 2015 featuring Dr Gary Cass.

- **Other Activities:** GEMIA delivers and participates in a range of key activities and events which reach a broad audience including community stalls, field trips, astronomy nights, careers talks, school visits, networking events and National Science Week activities.

Supporters: Inspiring Australia (National government strategy for science engagement Scientists and communicators promoting science literacy), Scitech, CME, WASM, Northern Star, GE Workforce Development Alliance, 16 mining companies.

4. Get Into Resources

Get Into Resources is an initiative designed to promote interest in resource sector careers by engaging high school students and bringing them together with people employed in the industry, to experience a day of presentations, activities and dialogue. *Get Into Resources* celebrated their 5th anniversary in 2016. Held annually in June at North Metropolitan TAFE.

Get Into Resources is for Year 10 secondary school students who are about to make their career choices and subject selection for senior school. Students rotate through a series of 30 minute activities and presentations about a range of resources careers. The workshops feature insights into a range of occupations from industry professionals. These include geologists, surveyors, metallurgists, environmental scientists, engineers, health and safety, human resources, technicians and tradespeople. These workshops can help Year 10 students choose the appropriate school subjects for their area of interest.

Get Into Resources has had over 1000 students attend throughout the last five years. Current resource industry workers are potential role models and mentors and by presenting at *Get Into Resources* they give students an opportunity to meet people already working in mining and related sectors. *Get Into Resources* participants experience firsthand what people in the industry do and even have an opportunity to visit a simulated underground mining environment (The CUT) situated at the same venue.

Supporters: GEMIA/ESWA/ North Metropolitan TAFE in kind, CME and other industry associations, resources companies.

5. Company STEM Initiatives/Partnerships

Alcoa: Alcoa Maths Enrichment Program (Scitech) and funding for 10 girls every year to travel and stay in Perth to attend Science Week activities as well as an Alcoa site tour/visit.

AngloGold Ashanti: School site visits for year 11 and 12 students in the goldfields region. They also offer work experience placements and university scholarships for Indigenous students.

ATCO: School excursion program for year 4 and 5 students.

BHP Billiton: BHP Billiton Foundation, Bring your daughter to work day, Aboriginal Education Program (Scitech), CSIRO Lab (Scitech), BHP Billiton Exhibition Gallery (Scitech).

Chevron: Vacation and Cadetship Programs, Chevron Powering Careers in Energy Program. Apprenticeship and traineeship program, Chevron Women in Engineering, Wheatstone Operations Aboriginal Engagement Program, Aboriginal School Scholarships, Aboriginal Education Program (Scitech), Beyond the Beaker (Scitech), Primary Teacher Support program (Scitech), Secondary Teacher Mentor program (Scitech), Science Café (Scitech), Women in Engineering education program (ACEPT), Powering Careers in Energy.

Cliffs Natural Resources: Mine site work experience program for students and their teachers.

Cristal Mining: Provides work experience for year 11 and 12 students. Cristal Mining also has representatives who attend career days at local schools.

Georgiou Group: Partnership with Balga SHS and Shenton College.

INPEX: Supports the Petroleum Club's Next Generation Program.

Resolute Mining: Scholarship open to current mining engineering students.

Rio Tinto: SMART Online Education Portal, Women in Engineering Mentoring program (UWA), Aboriginal Education Program (Scitech), Beijing Bound science competition (Scitech), DIY Science Kits (Scitech), RoboCup Junior WA (Scitech), Rio Tinto Innovation Central (Scitech), Science, Technology and Early Childhood touring programs (Scitech).

Roy Hill: Partnership program with Port Headland SHS. Roy Hill has also developed the 'Rock Ed' initiative to provide opportunities for the education community to view and learn about the remote operating control room activities.

Tronox: Partner with the Kwinana Industry Council to provide a scholarship for women in engineering. They also run a 'speed dating' like event between students and industry representatives.

Woodside: Science after School (Scitech), Scitech GT program, Woodside Scitech Science Awards, Technology and Science Collaboration.

6. Other Initiatives

Industry mentoring network in STEM (IMNIS): An initiative of ATSE that connects motivated second year PhD students (mentees) with outstanding industry leaders (mentors).

Former Department of Local Government and Communities: STEM and Trades Pledge Project, Expanding Careers for Women Scholarships, various sponsorships with STEM industry organisations.

Governor's School STEM Awards: established in 2015 to recognise the support and commitment of school principals and leadership teams in developing their schools' science, technology, engineering and mathematics (STEM) education programs. In doing so, the Awards aim to raise awareness of the importance of STEM education among school leadership, and incentivise them to support their teachers in undertaking STEM initiatives.

Let's Count: an early mathematics program for children aged three to five, developed by The Smith Family, Charles Sturt University and Monash University to support parents and early years' educators to develop the maths skills of the children in their care by noticing, exploring, and talking about numbers, counting, measurement and patterns in their daily lives.

Robogals: a student run organisation that aims to inspire and empower young women to consider studying engineering and related fields.

STEM Consortium: is partner in the agreement between the Department of Education (DoE) and Scitech, in partnership with a consortium comprising Educational Computing Association of WA (ECAWA), Maths Association of WA (MAWA) and Science Teachers Association of WA (STAWA), to deliver a three-year project aimed at developing STEM teaching and learning in W.A. schools. The broad outline of the contract between the parties relates to the delivery of 40 resource modules across Years K – 12, professional learning to support roll out across W.A. and online support accessible from the DoE Connect portal.

Techtrails Outreach Program: Women in Technology WA's (WiTWA) *techtrails* program is designed to encourage young people to consider careers in technology.

Women in Mining and Resources WA: School Speakers program.

7. Further Education Institutions with a focus on STEM

- **Curtin University:** Women in Engineering Scholarships, STEMinists (mentoring school students), WASM Focus on Mining Camps
- **Edith Cowan University:** Engineering Scholarships, ECU's Girls in Science and Technology (GIST) Magazine, Girls Programming Network
- **Murdoch University:** Girls only Coda Dojo
- **North Metropolitan TAFE:** Girls STEM Day, Get into Resources
- **University of Western Australia:** Girls in Engineering, Robogals chapter

Comprehensive guide to additional STEM programs (national):

<https://starportal.edu.au/>