Centre of Resources Excellence (CoRE)

Women in STEM Decadal Plan Champion Response 2019

WOMEN IN STEM DECADAL PLAN CHAMPION - RESPONSE 2019

Centre of Resources Excellence (CoRE) is a STEM (science, technology, engineering, mathematics) program focusing on Western Australia's place in the resources industry, providing quality hands on learning in the fields of mining, energy and earth sciences.

CoRE is a proven, contemporary student centered, project-based learning model, which has been developed over a fifteen-year period at Kent Street Senior High School in Western Australia.

CoRE Alumni are successful resource industry-based personnel whose CoRE Learning has provided them with the necessary STEM skills and capabilities to develop and navigate a career steeped in their passion, innovation and curiosity. CoRE's unique learning structure ensures everyone's skills, talents and abilities are utilised to complete a project; a project which is based on real world problems and one which is focused on turning situations into solutions**.**

CoRE is about reducing inequalities and celebrating inclusivity and diversity. In CoRE there is no bias towards, gender, age, socio-economic status, culture and most importantly talents and capabilities. The CoRE learning model provides every student with the opportunity to excel and work to the best of their capacity.

With 51% of CoRE Alumni being female (33% having English as a second language, and 10% identifying as Aboriginal or Torres Strait Islander) CoRE underpins the vision of the Women in STEM Decadal Plan by:

- **exciting, motivating and encouraging a new generation to pursue STEM industry careers in the mining and energy sectors**
- **building connections between schools, industry and government.**

The CoRE Learning Foundation is focused on expanding the CoRE Learning Model throughout schools in Western Australia and eventually, nationally. One of our priorities is to support, mentor and coach our CoRE Educators. We focus on the development of our student's social and entrepreneurial skills, promote STEM Learning through collaborative, real world industry learning environments, foster STEM career awareness and support our students CoRE Learning Journey as they transition into their tertiary STEM education and career pathways. The CoRE Learning Model is transdisciplinarian and can be applied to Australia's other burgeoning industries such as defence and agriculture.

> ***"I am a year 10 female CoRE student who came from an another school where science wasn't prioritised. Now I have the confidence to try new things, take risks and not be afraid to try and fail. This field trip has improved my stamina and tolerance, my teamwork and my observational skills."***
>
> ***Kent Street CoRE, WA Year 10 Student 2019.***

CoRE - Achieving Opportunity 4: VISIBILITY

Seeing women in diverse STEM careers, and equally represented in the media, in public events, an in other forums like boardrooms and classrooms will provide role models for girls and women and inspire a nation.

In CoRE, the SWANS (STEM/STEAM learning, Women in Leadership, Aboriginal Science, Networking and Sustainability) philosophy underpins the teaching and learning strategies of this contemporary learning model.

WOMEN IN STEM DECADAL PLAN CHAMPION - RESPONSE 2019

The leadership demonstrated by our CoRE STEM educators (mostly female, industry-experienced STEM professionals) has inclusively empowered our young STEM female students from diverse backgrounds to pursue STEM careers in Western Australia's burgeoning resources industry.

- STEM educators i.e. STEM industry trained educators are the leaders of CoRE delivery. The CoRE Lead (coordinators and educators) have previously worked in the resources industry and they share their understanding of how real world learning applies to their student's capabilities, talents and STEM career aspirations.

- STEM educators have the capacity to develop and grow trusting relationships with STEM students by sharing 'real' and engaging stories of their career journey, their achievements and their pitfalls. Students can develop an authentic understanding of their career journeys. In CoRE, this relationship is proven and validated by 51% female CoRE Alumni (Appendix 1). With access to real industry-trained STEM educators through CoRE, real-life leadership is made accessible to students who are empowered and encouraged as future STEM learners. This unique approach enables young women to pursue careers in the resources industry, which they would not otherwise have considered.

- In CoRE, the industry experiences of its STEM educators are embedded within the physical sciences and engineering, disciplines with low participation rates of women. Conversely, CoRE showcases the importance of physical STEM educators as a critical impetus to encourage young women to pursue further education and careers (Appendix 2). CoRE Alumni who have entered the resources industry in the physical STEM disciplines is 187% greater than the women currently employed by the West Australian resources sector.

2. ***Networking and 'Real Life experiences'***

CoRE's motto is **#therealclassroom.** Fundamental to its delivery are unique learning experiences such as field trips, networking industry events and self-development practices. In CoRE, female STEM students are encouraged to develop a network ecosystem based on attending industry events, developing a social media LinkedIn profile (from 16 years) and evolving their self-confidences through project presentation work.

- Female CoRE students attend many industry events during their CoRE years such as the WIMWA (Women in Mining Western Australia) Summit, Careers in Geoscience, Chamber of Minerals and Energy - Inspiring Girls.

- CoRE students are also provided with the opportunity to present their work to industry such as the Kalgoorlie CoRE Forum, the CoRE Industry Showcase and the AMEC Conference. During these events, all our female students from year eight through to twelve, are encouraged to talk with STEM industry personnel. They develop their communication skills, an awareness of the diversity of STEM careers and understanding of how their skills and capabilities are suited to STEM careers. Profoundly, the most significant feature of these networking events is the real stories these STEM personnel convey to students such as:

    - a real-life view of their STEM career pathway;
    - dispel misconceptions with respect to 'STEM is only for A grade students' and reveal to our CoRE students not to focus so much on the ATAR;
    - to believe in their passions and capabilities;
    - to understand that it is 'ok' to change your pathway and
    - that it is not essential to know what you want to be when you leave year 12

- CoRE field trips further reinforce how networking combined with real world exposure and learning cement the correlation between our STEM students' capabilities, their aspirations, self-worth and self-belief in their goal setting and purpose. Students talk to STEM personnel who work at the 'gold-face' and to see how their STEM

learning applies to their talents and aspirations - a powerful combination which empowers our female STEM students to pursue STEM careers in the resources industry (Appendix 3).

- Our CoRE Alumni give back to current CoRE students. This is a measure of sustainability and provides authentic visibility. It is a strong message when successful CoRE STEM females return to the school where they were taught and share with current STEM students their journey and experience. CoRE STEM Alumni have been asked to volunteer their time both in informal (class visits) or formal settings such as Women in Mining Events or at mine sites such as the Degrussa Mine site. Furthermore, our CoRE Alumni are often not typical 'Straight A' students - this reinforces for our current CoRE students the accessibility of a STEM career and provides an energised purpose to achieve (Appendix 4).

CoRE - Achieving Opportunity 5: EDUCATION

Strengthening the education system to support teaching and learning on a national scale will enable and encourage all girls and women at tall levels to study STEM courses and equip them with the skills and knowledge to participate in diverse STEM careers.

Why CoRE?

In CoRE, science and engineering is 'doing', it is 'hands-on' learning, learning focused on process learning and skills. CoRE has its students working as young scientists and engineers, problem solving, designing, investigating and exploring.

Design thinking, ICT and digital technologies together with more traditional learning processes such as explicitly, scaffolded learning are the foundation to student engagement and achievement.

CoRE is 'for the students, by the students,' it's learning model is collaborative; student feedback, facilitator mentoring, and reverse mentoring are critical enablers of its contemporary evolutionary development.

CoRE is a unique combination of:

- STEM industry educators, mainly female and of physical STEM industry experience
- its #therealclassroom approach which brings STEM industry practices into the classroom and takes its students out into the field to network with STEM personnel
- its industry, community and government links and collaborations
- its support for CoRE Alumni beyond their secondary and tertiary qualifications
- its inclusion of CoRE Alumni to inspire young females to pursue STEM careers.

To ensure that CoRE classrooms have the benefit of authentic CoRE leadership and learning, a fundamental goal for the CoRE Lead is to support, mentor and coach CoRE educators. STEM CoRE educators are paramount in the pursuit of inspiration and aspiration for the engagement and empowerment of females in STEM (Appendix 5).

WOMEN IN STEM DECADAL PLAN CHAMPION - RESPONSE 2019

CoRE - Achieving Opportunity 6: INDUSTRY

Access to a broader pool of skilled workers will become essential for business success

CoRE is responsible for the growth, sustainability and promotion of STEM females entering Western Australia's resources industry. With the establishment of the CoRE Learning Foundation (CLF) and its CoRE Expansion Program, the aim is to replicate Kent Street CoRE's graduation of female STEM students at regional and additional metropolitan schools (Appendix 6).

The CLF is a not-for-profit whose business model is based on industry, community, education and government partnerships - a collective aimed to develop and improve STEM outcomes for the STEM leaders of industry beyond 2025. (Appendix 7)

CoRE and its prototype-learning model have evolved as a result of industry collaborations. From the onset, the CoRE Lead sought sponsorship both financial and in-kind to develop and run unique CoRE learning experiences such as field trips. Since 2006, approximately $120,000.00 was amassed to support the development of the CoRE Learning Model, at Kent Street Senior High School, the CoRE Learning Foundation's Lighthouse School. Additionally, several companies provided in kind mine site, classroom visits and their time, to attend special events such as the Kent Street Women in Mining Events. Leadership demonstrated by the CoRE Lead, ensured that these partnerships were sustainable and evolving providing CoRE students with exposure to the latest in industry and technological practices and procedures. These industry-CoRE relationships are now seeing the benefit of investment through the success of the CoRE Alumni and now the development of the CoRE Expansion Program (Appendix 8).

Appendix 1 - A CoRE Alumni graph (2007 - 2018) to showcase career diversity for CoRE students and female STEM careers.

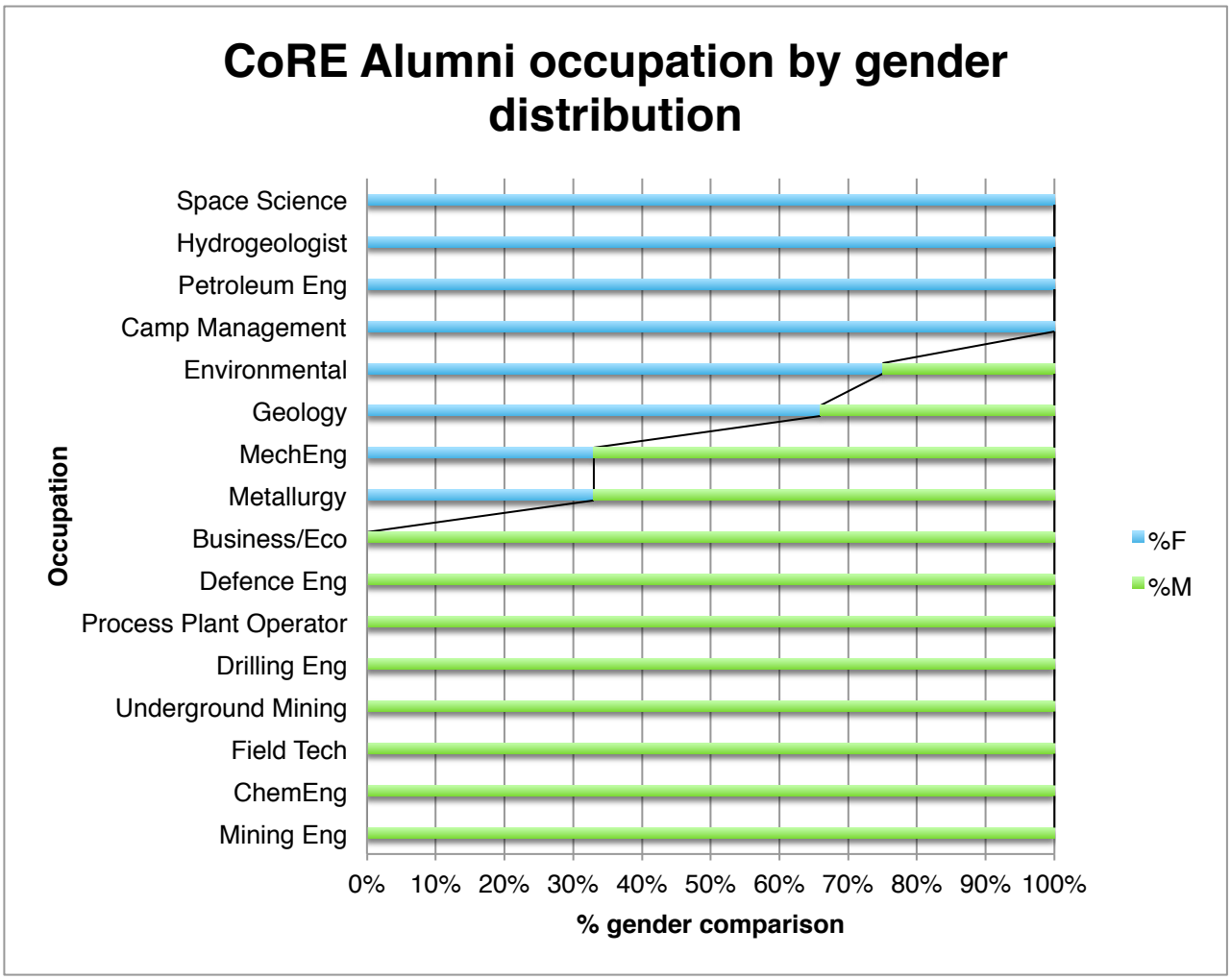


Figure 1.1: These figures were taken from a set of 50 CoRE Alumni (who have responded) and who graduated from 2007 - 2018 inclusive, from Suzy Urbaniak's Year 12 classes. Approximately, 50% of CoRE students have completed Tertiary resources and STEM pathways of which 98% are working in the resources sector. (As at 30/12/2018)

Appendix 2 - CoRE STEM females - The awareness of STEM pathways through 'visibility' as a result of STEM female educators leading by example.

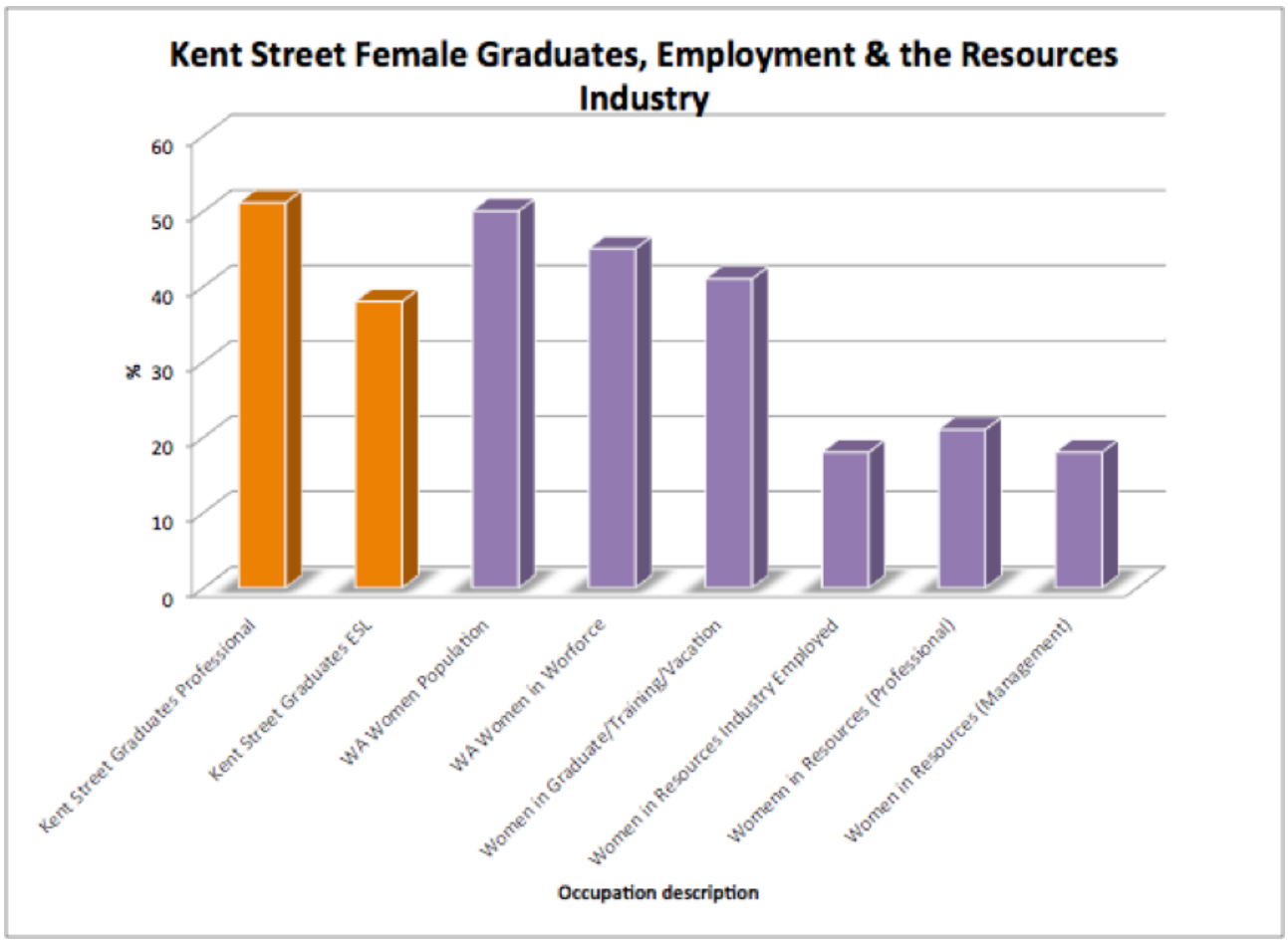


Figure 2.1: A comparison between female Kent Street CoRE Alumni and Women in STEM employed in the resources industry [1]. Kent Street CoRE Alumni equate to WA female population and Women employed in the WA workforce, however, compare the CoRE graduate, resources employment rate to the overall female employment rate of Women in Resources Industry employment. It is a staggering 183% greater. This value clearly identifies the importance of STEM workforce educators, guiding and facilitating learning within an authentic STEM learning environment. CoRE provides this system and its outcomes clearly articulate this key factor, as a major contributor in generating home grown talent to service resource pipeline career paths here in WA.

Appendix 3 - The CoRE Experience - Female students

1. Chloe – Tom Price CoRE 7 Evaluation - Karijini Field Trip 2019

"These few days in Karijini have been amazing. I have really loved getting out and about in the Pilbara environment. Being able to actually be interactive in the gorges. Applying these skills in the real life/world. Maths, science, safety, recording, measuring, reflection and lots more. The most interesting part for me was probably the folds and buckles of the gorge walls.

Where do I start with what I learned? This field trip we have learned so many new skills and information about Karijni Gorges. All about the spheres (lith,hydro, bio and atmos) How to measure and record information, put raw data into graphs/tables, safety skills, looking deeper into the rocks to find patterns, shapes, colours and layers. All about the sunlight, direction, bearing gorge trends, scientific names, the sunscreen issue, aluminium and photoxic chemicals. So much more has been discussed.

Next field trip I could be a lot less noisy so I do not disturb others at the Eco-Retreat, bring a better phone that has a longer battery life, work better in my business unity and not be so stressed about not being organised or focused the task."

2. Amy - Class of 2012 - CoRE Learning Model Evaluation and its purpose. Amy is now a hydrogeologist having just completed her Masters

"Firstly, the learning environment exposed me to the world of earth science and mining (STEM) as a possible career pathway. The mining industry or even the study of earth science was not familiar to me, nor did I ever think I would one day be working in mining. One of the skills I learnt was to be innovative and question ideas in science. Never just believe a statement – there must always be proof, results, evidence or examples."

3. Vino - Class of 2018 - The importance of self-development through the combination of the CoRE Learning Model and networking to ensure life-long learning and personal STEM career sustainability.

"CoRE has helped me develop interpersonal and intrapersonal skills. The engagement within a CoRE business unit enhanced my communication, teamwork and time management skills in all University group projects. Involving in CoRE has given me all the opportunities to connect scientific ideas and develop my scientific knowledge. Therefore, transitioning into uni didn't impact me as much as it would for a person without the CoRE experience. Overall, CoRE has helped me to be a confident, lifelong learner and I am proud to have been a part of the CoRE program."

4. Tara - Class of 2007 - One of the first CoRE prototype students. Tara's year 12 results were not satisfactory to gain direct entry into university but due to a Careers in Geoscience networking event in 2007 she was able to secure some geological technician work. This was her foundation to enter university and then become the geologist. Today she is working for FMG.

12 years after being in the inaugural CoRE learning class of '07, I am in the San Juan Province of Argentina. Here I am mapping and researching the Porphyry systems of the Central Andean Mountains. The benefit of #therealclassroom is life changing. For me it has shaped my entire career and in turn my life, as a Geologist.

5. Sameeksha - Kent Street CoRE 8 2019 - showcasing the importance of networking and presenting work to industry.

"CoRE gave me self-confidence because last year I was fortunate enough to be a part of the CoRE Showcase. Where I got to go out into the world and introduced myself to some amazing people and I got to do networking. CoRE is the one who gave me self-confidence, to shine and be out there."

Appendix 4 - CoRE STEM Visibility Networking Events

Figure 4.1 - Female STEM CoRE Alumni Tara and Bec (left) returning to Kent Street CoRE to share their STEM journey. Tara (Class of 2007) works for FMG and Bec (Class of 2009) works for Saracen. Both ladies are geologists.

Figure 4.2 - Female CoRE Educator (Suzy), CoRE Alumni (Elissa - Class of 2012), with Kent Street CoRE students at Sandfire's Degrussa mine site. Here, the students are provided with an authentic experience to understand how their learning applies to real world STEM careers. They are also provided with the opportunity to network with STEM personnel who work at the 'gold-face' and to learn from CoRE Alumni. Such experiences are reinforcing and confidence boosting for future female STEM leaders. 50% of those pictured Kent Street students are now studying geology at university.

Figure 4.3 Networking events such as the Kent Street Women in Mining event brings together female STEM personnel and CoRE STEM students. Lee-An (left), is pursuing a geology career and has had amazing success securing scholarships and vacation employment to support her career ambitions.

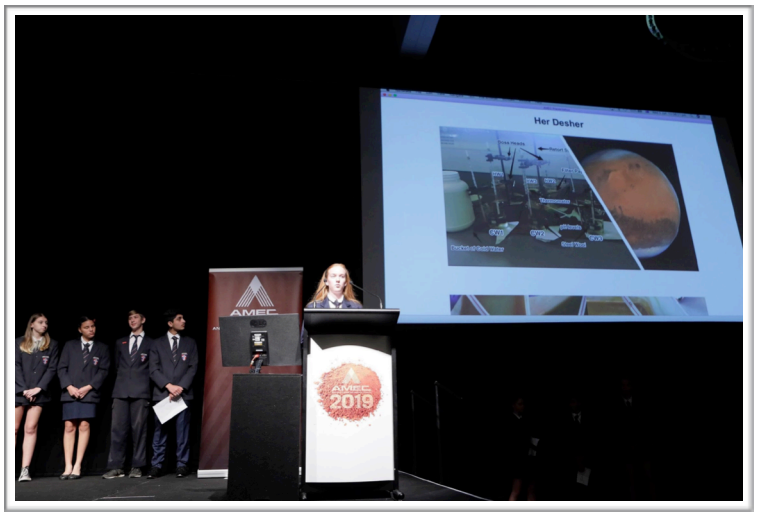


Figure 4.4 CoRE STEM female students from year 8 are encouraged to present their work to industry. Such learning experiences provide the students with the opportunity to communicate with STEM personnel and to identify how their learning, strengths and talents may apply to potential STEM careers.

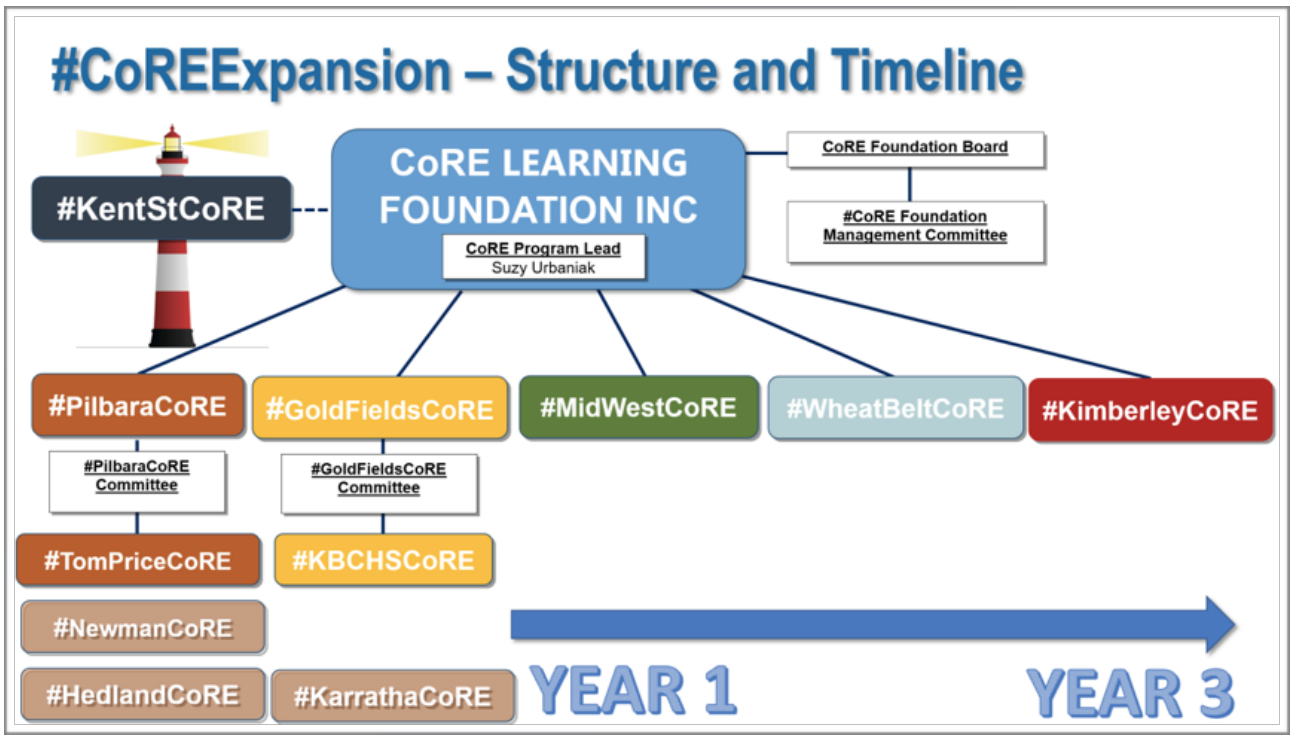
Fig 4.5 CoRE students are supported to promote themselves and the work they have produced. They are provided with showcase events to demonstrate how their #therealclassroom learning capabilities correlate with evolving STEM careers. In CoRE, networking and visibility are fundamental to female STEM attraction and progression into and through their careers.

Appendix 5 - The importance of STEM industry experienced educators' in supporting and promoting the engagement of young CoRE STEM students.

Figure 5.1 - Tom Price year 8 CoRE students during their Karijini field trip, using ICT to record their science observations. STEM CoRE educators who have had the experience of scientific process and inquiry are instrumental in engaging CoRE students. Such engagements facilitate improved STEM motivation for these students. In the short six-month period of their CoRE Learning, these three young ladies, have embraced their STEM learning to become leaders and high achievers in their cohort.

Figure 5.2: Our STEM trained CoRE educators are key to promoting and delivering an equitable learning model which embraces the personalities, capabilities and talents of our diverse student population.

Appendix 6 - The CoRE Learning Foundations projected vision for the CoRE Expansion Program as a mechanism, to replicate the Kent Street CoRE female STEM graduation rate at regional schools.



Appendix 7 - #therealclassroom learning opportunities such as The Resources Challenge, showcases partnership collaborations and meaningful STEM experiences for our CoRE students. Such events highlight the developing STEM pipeline, where students have the opportunity to speak with industry personnel, with the aim, to better understand how their learning applies to their talents and therefore their passionate STEM career aspirations.

Figure 7.1 and 7.2 - The inaugural Tom Price Senior High School Resources Challenge where industry representatives from Rio Tinto, Downer and the community, collaborated to provide a STEM learning experience for our Tom Price Senior High School CoRE and three feeder primary school students from Paraburdoo, Tom Price and North Tom Price.

Appendix 8 - A table of industry and industry associations who have provided both in kind and financial support, initially for Kent Street Senior High School and its CoRE prototypes and now the CoRE Learning Foundation.

Australian Institute of Geoscientists (AIG)	Iluka Minerals
Australian Geoscience Council (AGC)	UniMIn Minerals
Australian Institute of Mining and Metallurgy (AusIMM)	Talison Minerals
Chamber of Minerals and Energy WA (CME)	Galaxy Minerals
Chevron Australia	Evolution Mining
Western Areas	KCGM
St Barbara's	BHP
Newmont Australia	Sandfire Resources
WIMWA (Women in Mining and Resources WA)	Brumby Resources
Earth Sciences Western Australia (ESWA)	Western Australian School of Mines
Western Australian School of Mines Alumni	Curtin University
FMG	Goldfields Australia
IGO - Independence Group	Saracen Minerals
Creasy Group	Cliff's Natural Resources
Rio Tinto	Downer
Newcrest Mining	

Figure 8.1 - This table contains the names of the industry sponsors, from 2006, which CoRE (including CoRE prototypes) have collaborated with for improved, contemporary STEM education shared outcomes.