

The 2008 CRC Association Awards For Excellence
in
Innovation



**Sustainable Researchers:
CSRP School Teacher Professional Development
Program**



Submitted by

Centre for Sustainable Resource
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Sustainable Researchers: CSRP School Teacher Professional Development Program



Summary:

The CRC for Cooperative Resource Processing (CSRP) has implemented an innovative Teacher Professional Development program as an effective tool in addressing the decline in the number of young people studying the physical sciences.

Professor Léonie Rennie, Curtin University of Technology; co-author of seminal Commonwealth report *“The status and quality of teaching and learning of science in Australian schools: A research report”* commented on the CSRP Teacher Program,

“One of the crucial issues facing teachers in our schools is the necessity of keeping their science content knowledge up-to-date, and knowing how to incorporate that knowledge into curricula that are often slow to change. Opportunities for professional development, such as those offered by CSRP’s Teacher Program, where teachers are able to work side-by-side with scientists who can demonstrate aspects of their everyday activities, or be able to make on-site visits to experience and discuss science with scientists in contemporary contexts, provide valuable avenues for teachers’ professional learning. The resulting enhancement of their classroom practices will, in turn, benefit their students and promote their interest in and understanding of science.”

Sustainable Researchers: CSRP School Teacher Professional Development Program



The CRC for Cooperative Resource Processing (CSRP) has implemented an innovative Teacher Professional Development Program as an effective tool in addressing the decline in the number of young people studying the physical sciences.

Background

When one speaks of "sustainability issues" facing Australia today, it would be both short sighted and counterproductive to ignore the importance that an ample supply of human capital has on the long term viability of our economy. Within the CRC for Sustainable Resource Processing (CSRP) it is acknowledged that there can be no research without researchers, nor can there be any employer without employees. Specifically, this increasing shortage of young people choosing careers in the minerals industry goes beyond Australian shores and is rapidly becoming a global problem.

The problem goes even deeper. There is ample evidence within Australia that fewer and fewer school students opt to pursue the STEM (science, technology, engineering and mathematics) subjects which in turn results in decreasing numbers of tertiary students studying in technical areas.

Can a CRC have any effect on students studying school science? Is there a cost effective way of doing this?

There is a great deal of evidence that supports the notion that school teachers have a strong influence on their students in course selection and career choice (Churach & Welham, 2007; Churach, 2004). The CSRP Teacher Program is based on the idea that educating teachers in real-world, industry-based technologies is the most cost effective way of reaching students. In short, allowing teachers to see where the fundamental school curriculum fits into the industrial setting will affect their attitudes towards sustainable mineral processing in a favourable way. In turn, this will allow school teachers to provide their students with a greater opportunity to learn of the application of science within the minerals industry and to increase their awareness of career options in technical areas.

The Context:

- The Minerals Sector is the largest export earner for Australia
- Access to human capital is increasingly a bottleneck for production

The Issue

- Fewer and fewer school students are studying the enabling sciences
- Fewer tertiary graduates in STEM subjects
- Fewer Australians choose scientific research within physical sciences as career

The Response

- CSRP Teacher Program implemented
- Evidence suggests teachers are good market multipliers in reaching students

The Outcomes

- 500 teachers already involved in the program
- ~60,000 school students taught and influenced by these teachers
- Quantitative and qualitative data show that the program affects teacher attitudes towards industry in a positive way

The Future

- Continue and expand in WA and QLD
- 2008 Teacher Program to Victoria
- New professional development events planned
- *Over 1000 teachers will take part!!*

The Participants

CSRP and Murdoch University have been the principal collaborators in developing and presenting the professional development activities. In Western Australia the Science Teachers Association of Western Australia (STAWA) has been an integral partner. In Queensland, Gladstone Area Mathematics, Science and Engineering Teachers, Queensland Alumina and Education Queensland have supported the Teacher Program. In every case CSRP's industry participants as well as the Minerals Council of Australia have collaborated in outreach efforts.

Teachers are self-selected for these courses; flyers are posted on the web and the local Science Teachers Association bulletin boards and other education websites. As the major courses are run

outside term time, teachers have to be willing to forego a day of holiday to attend. At the end of each course, teachers receive a participation certificate which may count towards the compulsory annual Professional Development requirement. To date approximately 500 teachers in Western Australia and Queensland have been involved in one or more of these activities. If one makes a conservative estimate that each teacher has 120 students under their tutelage, then some 60,000 Australia school students have already gained a better insight into the mineral resource sector due to the CSRP Teacher Program.

Sustainable Researchers: CSRP School Teacher Professional Development Program

Professional Development for Teachers

The Teacher Program has evolved over the life of the CSRP. Because one of the aims of the project is to develop an on-going network of school teachers, the development of a variety of professional development (PD) activities is essential. These PD events fall into three categories, namely full day workshops, 90-120 minute after school PDs and technical site tours. Generally the full-day courses require specialist laboratory facilities whilst the shorter professional development sessions (PDs) are designed to be portable and be run in high school laboratories.

For each event Teacher Participants receive a comprehensive set of notes which cover the metallurgical process, contain detailed instructions on how the experiment can be duplicated in a classroom environment and recommendations on how the experiment relates to the curriculum. Importantly, the notes detail the underlying physics, chemistry and engineering challenge of the processes involved.

A sample of these activities is described below.

Full Day Teacher PD Courses

The Chemistry & Physics of Extractive Metallurgy

This introductory course gives an overview of how mineral processing adds economic value to the rich mineral resources with which Australia is blessed. The day begins with a synopsis of the industry from geological prospecting to mining engineering and a description of the processes used to extract metals from ores. Academic staff and/or research students then lead the teachers through three sessions involving practical work in the three primary areas involved with extractive metallurgy; Mineral Processing, Hydrometallurgy and Pyrometallurgy.

Mineral Processing: Participants employ industrially relevant processes including froth flotation, magnetic and electrostatic separation to recover the valuable minerals from the ore.

Hydrometallurgy: Participants use simple solution chemistry to extract and purify copper by bench scale leaching and electrowinning of copper from an oxide ore. One of the highlights of the day is having each teacher gold plate their own chemist's spatula to take back to school with them.

Pyrometallurgy: Heat and fluxes are used to reduce a tin ore to metallic tin and each teacher pours an ingot they can take back to their students.

The final wrap up session aims to pull together the day's events and relate it to the school curriculum at various year levels from upper primary through upper secondary. Teachers receive a booklet containing extensive notes detailing the experiments with a range of materials for use in the classroom.

Advanced Extractive Metallurgy

The Advanced Extractive Metallurgy course was developed as an outcome of many teachers requesting a more in-depth view of topics explored in the introductory offering. Using a large high-grade boulder obtained as the source of ore, the teachers first crush and grind the rock and then screen and sort the sample in the mineral processing laboratory. The participants next move to the hydrometallurgy lab where they leach the ore in a bench top apparatus and then collect the loaded solution for processing. Atomic absorption spectroscopy techniques are used to assay a small portion of the sample. Finally, the teachers use electrowinning techniques to produce a pure copper foil sample.

After School Teacher PDs

Copper Recovery from Oxide Ores by Leaching, Cementation and Electrowinning

Copper is one of the most important metals in today's society being essential for almost all electrical appliances. However, its abundance in the earth is remarkably low and we can economically mine it only where nature has concentrated it. This hands-on workshop demonstrates the extraction of copper from an oxide ore using equipment and reagents found in every school's chemistry laboratory. By the end of the workshop participants are able to produce copper metal from ore and applications of the experiment to the chemistry curriculum are discussed.

Alumina Production from Bauxite by the Bayer Process

Teachers are taken through the three main stages of the Bayer process using Fauxite™ – a synthetic material with analogous chemical properties to bauxite (as alumina ore is known). This is done because the real process is too hazardous to duplicate in a school environment. The Fauxite™ is first leached (digested) in an ordinary plastic water bottle. The mixture is allowed to settle (clarification) showing a significant reduction in volume of solids as the soluble portion goes into solution leaving red mud in the bottom of the bottle. The solution is decanted and then seeded to allow crystallisation to occur. The white crystals precipitate leaving behind a clear solution able to be recycled to the leach stage.

Mineral Properties and Identification

Minerals are the building blocks of the earth and from these come an amazing variety of products from diamonds to silver to bricks. This workshop uses a set of mineral samples in hands-on activities to demonstrate the properties of minerals. It also allows the participant to develop a scheme for identifying minerals based on the physical properties of lustre, colour and streak, hardness, specific gravity and other special properties.

"Thanks again for a great day. My chemistry students back in Miles were so jealous when I told them we did a thermite experiment. They are all going to be... engineers at this stage. Cool hey!" Matthew Daniels, Kawana Waters State College, Queensland.

Sustainable Researchers: CSRP School Teacher Professional Development Program

Industry Site Visits and Research Laboratory Tours for Teachers

Visits to mine sites, processing plants, research laboratories and the like are a key tool in the professional development activities school teachers need to give them a broad based view of the energy and mineral resource sector.

Because most teachers have spent a lifetime in the classroom teaching students textbook science, these opportunities allow them to realise the “real world” application of their classroom theory to solve industrial problems. Site tours also allow for interaction with and instruction from the experts at industry and research facilities. Personal contacts are critical to the maximising the benefit of this kind of professional development activity and allow teachers to build these firsthand experiences into their classroom programs.

It Needs a CRC to Work!

A review of existing programs around Australia reveals that many universities and numerous companies have education outreach programs that are aimed at (mostly) students and (occasionally) teachers. Anecdotal evidence collected in teacher interviews supports the view that these single-provider professional development activities may often be viewed as beneficial, but favouring the specific university or company in its “sales pitch” to participants. Similar findings were documented during a 1980s initiative in the UK (The Technical and Vocational Education Initiative or TVEI) when the government attempted to involve industry in teacher professional development. Initially many teachers were quite suspicious of the motivations industry sponsors may have had in working with schools, worried that controversial industries merely wanted to change their images (Keith, Lakin & Callaghan, 2000). The fact that CSRP is a CRC and, by definition, a collaboration of industry and research providers, allows the Teacher Program to be viewed as representative of a sector-wide consortium of researchers and scientists, not one individual part of it.

Measures of Success

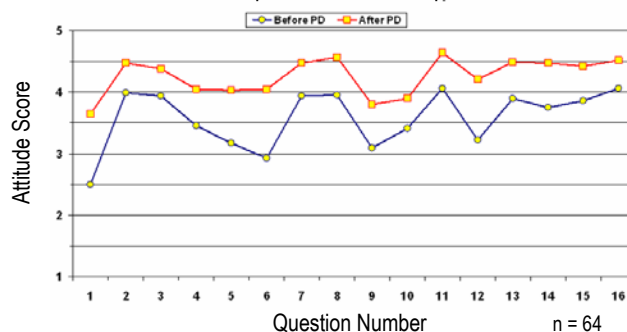
There is currently a PhD research project investigating influences associated between the professional development activities offered by the CSRP Teacher Program and positive changes in teacher attitudes towards the energy and mineral resource industry (Nichols, D, Churach, D & Fisher, D, 2007).

The on-going study has now collected data on more than 100 participating teachers, with outline results reported in Figure 1. It is interesting to note that the two greatest shifts in response were with the teachers’

overall knowledge of the industry and teachers getting to know and network with scientists. Other notable shifts in teacher attitudes were in teacher willingness to provide career information to students and to use mining and mineral processing examples in class. In the four attitude shifts mentioned here, the small standard deviations and high statistical significance are just what one would anticipate if a strong association existed between the Teacher Program and a change in teacher attitudes. This research is on-going.

A final quote from **Professor Léonie Rennie**, Curtin University of Technology; co-author of seminal Commonwealth report “*The status and quality of teaching and learning of science in Australian schools: A research report*” commented on the CSRP Teacher Program, “*One of the crucial issues facing teachers in our schools is the necessity of keeping their science content knowledge up-to-date, and knowing how to incorporate that knowledge into curricula that are often slow to change. Opportunities for professional development, such as those offered by CSRP’s Teacher Program, where teachers are able to work side-by-side with scientists who can demonstrate aspects of their everyday activities, or be able to make on-site visits to experience and discuss science with scientists in contemporary contexts, provide valuable avenues for teachers’ professional learning. The resulting enhancement of their classroom practices will, in turn, benefit their students and promote their interest in and understanding of science.*”

Figure 1: Teacher attitudes towards mineral processing industry before and after professional development activities.



Future Plans

The CSRP Teacher Program will be expanded in 2008 to Victoria (Ballarat and Geelong) and to other regional locations in Western Australia (Busselton and Bunbury) and Queensland (Mount Isa and Cloncurry). Additionally, more short courses will be developed as well as more industry and mine site tours. **It is anticipated that more than 1000 teachers will attend one or more CSRP Teacher Program events.**

Churach, D & Welham, N (2007) “Secondary school science teachers as the key to a sustainable workforce in the mining and mineral processing industry – Changing peoples’ attitudes”. *Proceedings of World Gold 2007: By and co-products and the environment*. Cairns, Australia, 22-24 October 2007.

Churach, D. (2004). “Teacher-industry synergies: A convergence of problems offers sustainable solutions.” *SCIOS: Journal of the Science Teachers’ Association of Western Australia*, 2 (40), 11-17.

Keith, R., Lakin, L, & Callaghan, P. (2000). *Teaching secondary science: Constructing meaning and developing understanding*. David Fulton Publishers, London.

Nichols, D, Churach, D & Fisher, D, (2007). “Industry-funded, content-rich professional development: Influences on attitudes towards applied science” *Proceedings of National Association of Research in Science Teaching 2007 Conference*, New Orleans, USA, 17 April 2007.

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Photographs



Teachers doing a hands-on copper leach experiment using plastic water bottles and crushed ore in an after school PD in Townsville, Queensland.



The thermite reaction captures teachers' attention at Murdoch University labs.



A chemistry teacher shows off the gold-plated spatula she made in a hydrometallurgy PD, anxious to take it back to her school to show students.

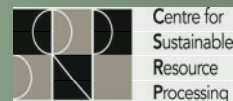
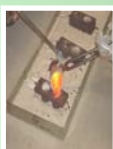


Teachers check a leach column in an advanced extractive metallurgy laboratory.

**Sustainable Researchers:
CSRP School Teacher Professional Development Program**

Letters of Support

Sustainable Researchers: CSRP School Teacher Professional Development Program



Statements of Support

“The material was not only engaging but showed what could be achieved with the simplest of equipment while still delivering high quality science. It will be particularly useful to the new Chemistry program which we are writing as I can see that the material could be incorporated into an extended research project for the students. It was pleasing to see that the material was presented in an unbiased way and was not trying to promote any one company agenda.”

Elizabeth Anderson, St Ursula's College, Toowoomba, Queensland

“I thoroughly enjoyed this course — it was great to be able to do some new hands-on experiments. The gold plated spatula has been a real hit at school.”

Helen Trend, St. Hilda's College, Perth, WA

“A million thanks for enabling me to have the most wonderful experience by visiting the mine last week — it was really the high point of my holiday. I have been enthusing my family and students with the story ever since...”

Dr Mary Oliver, Former Head of Science, Corpus Christi College, Perth, WA

“It was terrific to see the genuine enthusiasm the teachers showed for our research. This was very evident from the questions asked during and after their visit. Enthusiastic science teachers are essential for promotion of science at school and the supply of quality undergraduates to universities.”

Dr Martin Houchin, Emerging Technology Program Manager, CSIRO Minerals

“The two sessions I attended were fantastic. They were structured and provided great insight into the importance of both the aluminium and copper industry. As a teacher, it provided me with valuable scientific information that I could use in the classroom either as an experiment or a discussion point. Besides being educational the day was entertaining and renewed my passion for science, especially that which is related to the mining industry.”

Matthew Daniels, Kawana Waters State College, Queensland

“It is very generous ...to provide teachers with the opportunity to see chemistry in an industrial context and to be able to understand another employment avenue for our students. For the teacher to be able to relate the course to real world situations seems to bring it alive for the kids.”

Lyndon Smith, Chemistry Teacher, All Saints College, Perth, WA



Thursday, 31 January 2008

CRC Awards Committee for
Excellence in Education and Training Innovation

Mr Michael Hartmann,
Chief Executive Officer, CRC Association
Engineering House
Unit 4, 11 National Circuit
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Dear Mr. Hartman,

I write in strong support of the nomination of the Centre for Sustainable Resource Processing (CSRP) for the CRC Award for Excellence in Education and Training Innovation.

As an active participant in coordinating science education activity in Western Australia and personally managing a team of 6 staff delivering professional learning for teachers, I am quite comfortable in stating that the CSRP's Professional Development program is the most engaging and informative program that I have seen or been involved in within the last 10 years.

It is evident that Western Australia is a State economically reliant on the resource sector and of course producing a quality workforce to support it. It is also important to note that the wider general public (including students and teachers) require an appreciation of this importance. Today's students will be running tomorrow's resource sector and will be required to manage the States assets in a sustainable and responsible manner. The task of inspiring and educating these students lies squarely with our teachers.

The CSRP's Professional Development (PD) program aims to give school teachers hands-on experience with the applied science used within the mineral processing industry with a view to fostering greater interest in the study of maths and sciences in our young people. They provide a great insight to how classroom chemistry and physics is taught in WA and how it is applied to real-world industrial problems resulting in tens of billions of dollars of Australian income.

Not only does the PD offered by the CSRP broaden teacher understanding in this area, it also develops ongoing education support networks that provide more sustainable and effective outcomes in WA schools. It is also provides an opportunity for open discussion of the issues facing the industry.

It should be noted that one of the key strengths offered by the CSRP PD program is its independence. With the program being delivered under the umbrella of a CRC education program, the content and presenters are seen as non-biased and non-affiliated with a mining, university or science organisation – they are there to inform and inspire. On that note I must point out the value that Mr Dan Churach (Education Manager) offers the program. Mr Churach is a true leader in this field and has no doubt “switched on” hundreds of science teachers in his time.

In summary, the Centre for Sustainable Resource Processing PD program helps shed light on industry in a way that most teachers (and therefore their students) never have the opportunity to experience. Having been an attendee at one of the CSRP professional development programs in 2006, I can confidently say that there are many teachers in WA who now have a better understanding of the economic importance of this industry, its technical and scientific aspects and the value in obtaining a better understanding of the industry for wider dissemination in the classroom.

Again – I commend the CSRP Professional Development program to the CRC Awards Committee as being an extremely worthy candidate for the Excellence in Education and Training Innovation award.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Paul Nicholls', written in a cursive style.

Paul Nicholls

Director Science Partnerships &
Professional Learning
Scitech



Senior Science Officer - Toowoomba
Curriculum Division
Education Queensland

February 5, 2008

CRC Awards Committee for
Excellence in Education and Training Innovation
Mr Michael Hartmann,
Chief Executive Officer, CRC Association
Engineering House, Unit 4, 11 National Circuit, BARTON ACT 2600

Dear Mr. Hartman,

I am pleased to have the opportunity to support the submission by the **Centre for Sustainable Resource Processing (CSRP)** for consideration in the annual Awards for Excellence in Innovation in Education.

As the Senior Science Officer appointed to the Toowoomba area under Queensland's *Science Education Strategy 2006-2009* my focus is the provision of targeted high quality professional development for curriculum leaders and teachers of science.

Senior Science Officers have been appointed to work across the state to facilitate opportunities for teacher professional development through building stronger partnerships with real-world scientific industry and research organisations. The CSRP Teacher Program has assisted us in working towards achieving our goals.

I first met the Centre for Sustainable Resource Processing (CSRP) and Murdoch University representatives at the ICASE/CONASTA Conference in Perth, July 2007. The team were keen to discuss Professional Development (PD) opportunities and prepared to travel to Toowoomba, Queensland to offer the CSRP's Teacher Professional Development Program in Minerals and Metallurgy.

The CSRP's Teacher PD Program is aimed at giving school teachers hands-on experience with the applied science used within the mineral processing industry.

By providing quality, effective, and "real world" professional development to Science and Maths teachers, it increases their knowledge and interest of industry practices and processes. With accessible and practical materials at their disposal, teachers are able to foster a greater interest in the study of maths and sciences by young people.

This type of PD activity sheds light on industry in ways the average teacher (and therefore school student) would never have been able to see otherwise and the PD allows for broader applications of curriculum-related science as it is applied to everyday problems.

This activity has enabled teachers to enhance classroom curriculum with real-world technology, thus allowing teachers (and therefore students) to understand the relationship between theory and practice which produces more value and wealth for Australia and our people.

The impact of the CSRP program can be judged from the following comments from teachers who participated in the CSRP workshop in Toowoomba, October 2007 and some ideas they had for future workshops.

Comments

- “Love the industry link with chemistry...”
- “Any workshops like this that help teachers relate industry to the classroom is good.”
- “More workshops along the mineral line...”
- {We need} “...more accessible student practicals that involve industry.”

The teachers were very enthusiastic to apply what they had learned after the CRC-sponsored Professional Development offered by the CSRP and are looking forward to the opportunity to learn more. I am keen to continue the relationship with the CSRP and Murdoch University in the future and look forward to working with them on prospective CSRP’s Teacher PD opportunities in Queensland during 2008.

Yours sincerely



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1st February, 2008

CRC Awards Committee for
Excellence in Education and Training Innovation
Mr Michael Hartmann,
Chief Executive Officer, CRC Association
Engineering House, Unit 4, 11 National Circuit, BARTON ACT 2600

Dear Mr. Hartman,

Please accept this letter of support for the nomination of the **Centre for Sustainable Resource Processing (CSRP)** for a CRC Award for Excellence in Education and Training Innovation.

A key aspect of Education Queensland's **Science Education Strategy 2006-2009** is the provision of high quality professional development programs for science teachers. The focus of the strategy is to design and present programs in partnership with science professionals and organisations.

I was first involved in professional development brokered by the CSRP in 2006 in Gladstone, Central Queensland. Gladstone and the surrounding area's local economy is greatly influenced by refining and smelting of aluminium and corresponding service industries. Two professional development events were held by the CSRP in collaboration with Gladstone Area Mathematics, Engineering and Science Teachers Association (GAMSET) and Murdoch University. As a teacher of senior chemistry, I found the sessions to be extremely useful. The combination of exciting presentations and access to quality up-to-date information was inspiring. The high quality resources and experiments were easily incorporated into the existing curriculum unit on aluminium production and in my estimation significantly increased the student's enthusiasm for the subject. I have also used variations of these experiments with other student groups and always with much acclaim from the students.





In 2007 when I accepted the position of Senior Science Officer I discovered the CSRP an extremely effective organisation to negotiate professional development through. Though I am now located in Cairns I was able to organise sessions with CSRP officers and Murdoch University for Cairns, Townsville and Charters Towers. This year negotiations are well advanced to link staff from University of Ballarat and Xstrata with teachers in the Mt Isa region. That I have been able to achieve connections between these groups from my base in Cairns is testament to the effectiveness of the CSRP. This type of industry-academic-community partnership is invaluable for teachers, particularly in rural and remote regions, as they strive to inject authentic science into the curriculum.

In 2007, twenty teachers, from five local high schools, attended the sessions in Cairns with feedback showing they were extremely satisfied with the professional development provided. The teachers thought the workshop was easy to follow and fun, gave examples of experiments useful for their curriculum development and scientific content that was accessible and suitable for students. Teachers were impressed with the ease with which links were made from classroom science to industrial science and very keen to share that material with their students. Teachers expressed their fascination with all aspects of the industrial process, in particular the inventive solutions designed to cope with science processes on a massive scale. They were unanimous in requesting similar professional development sessions in the future. The Science Head of Department from the host school was extremely grateful for the opportunity provided and has expressed his desire to hold future events at the school. Additionally, the Heads of Department from other schools in this region are very keen to host future events.

Finally, it was very noticeable that the professional development sessions focussed on science with little mention made of a particular university or company. This is another advantage of brokering an event through a Cooperative Research Centre such as the CSRP since it increases the event's appeal for teachers. Teachers can focus on the science and how to use it in their curriculum, not spend time on promotional material from outside agencies.

In conclusion I am extremely grateful for the professional assistance the CRSP have provided to bring interesting and authentic science to teachers in regional Queensland. The enthusiasm and interest generated can only benefit our students.

Yours sincerely

Clifford Jackson

Monday, 4 February 2008

CRC Awards Committee for Excellence in Education and Training Innovation

CRC Awards Committee for
Excellence in Education and Training Innovation
Mr Michael Hartmann,
Chief Executive Officer, CRC Association
Engineering House, Unit 4, 11 National Circuit, BARTON ACT 2600

Dear Mr. Hartman,

I write to support the application of the Centre for Sustainable Resource Processing in its application for a CRC Association Award for Excellence.

During the last few years the Professional Development available to teachers in WA has generally been limited to attempting to describe the requirements of the various new syllabus documents.

The CSRP has been instrumental in offering a completely different professional development experience by focussing on knowledge, application and links between school and industrial systems.

I, and many of my colleagues from All Saints' College, have attended both the Introductory and Advanced Extractive Metallurgy PDs at Murdoch, been to the Curtin University Laboratories and have even been taken to see mining and mineral processing in the goldfields.

I have been especially fortunate in that the CSRP was been willing to directly assist my students in helping them to win a research grant to investigate Battery Recycling – "Dispose of Properly". I can say that CSRP has been ever-willing to respond to any request to help spread education about the usefulness of studying Maths and Physical Sciences within the mineral processing industry that does result in tens of billions of dollars of Australian income.

Many of our teachers have not had the industry experiences that I have had. They say CSRP Teacher Program has done wonders for offering a hands-on link between their theory and practical industrial applications of the science they teach.

The enthusiasm of the CSRP, university and industry staff have emphasized the excitement that science and technology can offer as a career choice. Additionally, the general tertiary link that CSRP offers rather than a company or university specific association is an unusual attribute that I don't think can be offered elsewhere.

Overall I would like to emphasise that the CSRP has made its presence known in Western Australian education by generously offering its programmes to all teachers and furthering their knowledge base of the state's mineral processing industries.

I look forward to a long association with the CSRP



Lyndon Smith
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