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**Minerals Council of Australia  
National Tertiary Education Taskforce**

**Back from the Brink  
Reshaping Minerals Tertiary Education**

**Discussion Paper  
February 1998**



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COUNCIL**  
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*“A great deal of attention has lately been given to the discussion as to the education required for engineers, and especially for mining engineers. ... The Institute of Mining and Metallurgy had a few years back a very long discussion on the subject, and the subject appears to be one of perennial interest to similar societies.”*

**Lewis JB (1905)**

*‘The Training of a Mining Engineer’*

Proceeding of the Australasian Institute of Mining Engineers, Paper 169.

*“In his presidential address for 1970 entitled ‘Men for Minerals’, W.J. Cuming (1970) focussed on the shortage of technically trained personnel for the mining industry and the need for communication skills ... [Sir James Foots focussed education] in his presidential address to The Institute in 1974 which was entitled ‘Ore to metal - the education needs’.”*

**Rose JM and Brady JT (1993)**

*‘Overview of Mining and Metallurgical Education in Australasia’*

Monograph 19, The AusIMM, Melbourne.

It would seem that tertiary education for the minerals industry has been and will continue to be an issue for some time.

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## Foreword

The Western Australian Minerals Industry Tertiary Education Taskforce Discussion Paper attracted considerable interest from industry and university sectors upon its release in July 1996. The general directions articulated by the Western Australian Taskforce were widely acknowledged as a useful start in a much-needed debate. Major recommendations of the Western Australian Taskforce were that a 'National Centre' for the education and training of minerals industry specialists be established and that the Minerals Council of Australia should convene a working party to progress the establishment of this National Centre.

The Minerals Council of Australia consequently established the National Tertiary Education Taskforce to identify specific steps for improving minerals tertiary education in Australia. This discussion paper, developed by the Taskforce and its Working Party, endeavours to build upon the foundation established by the Western Australian Discussion Paper.

The Taskforce members are:

	<b>Position</b>	<b>Representing</b>
RJ Carter (Chairman)	Chief Executive Officer, BHP Minerals Now Retired	Minerals Council of Australia
BL Cusack	Managing Director, Rio Tinto Australia, Rio Tinto Limited	The Chamber of Minerals and Energy of Western Australia Inc.
P McCarthy	Managing Director, Powercoal Pty Ltd	New South Wales Minerals Council
E Muir	General Manager Human Resources Technology Group, Rio Tinto Limited	The Australasian Institute of Mining and Metallurgy
P Munro	Principal Engineer Metallurgy, M.I.M. Holdings Limited	Queensland Mining Council
C Rawlings	Managing Director, QCT Resources Limited	Queensland Mining Council
D Stuart	Assistant Director - Education	Minerals Council of Australia
K Braund (Exec. Officer)	Executive Officer, National Tertiary Education Taskforce	Minerals Council of Australia

The Taskforce was supported by a Working Party comprising:

	<b>Position</b>	<b>Representing</b>
Peter Fairclough	Government and Public Affairs Manager, WMC Resources Limited	The Chamber of Minerals and Energy of Western Australia Inc.
Majella Fowler	Manager Human Resources, BHP Manganese	Minerals Council of Australia
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Martin Lynch	Manager - Strategic Marketing, Hamersley Iron Pty Limited	Minerals Council of Australia
Helen Macdonald	Human Resources Officer - Education, Normandy Mining Limited	Northern Territory Minerals Council
Tim Scully	Group Manager - Corporate Human Resources, WMC Resources Limited	Minerals Council of Australia
David Wallace	Manager - Exploration, Aberfoyle Resources Limited	Minerals Council of Australia
Brian White	Director, Tennent, Isokangas Pty Ltd	Queensland Mining Council
Lesley Wood	Graduate Recruitment and Development Adviser, M.I.M. Holdings Limited	Queensland Mining Council

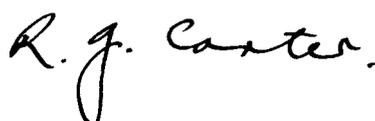
The Australian minerals industry's main concern is that, in various areas, new industry professionals need to be better equipped to deal with current and emerging challenges such as globalisation of companies, ever-toughening competition, and rapidly changing technologies. The industry is seeking to ensure that there are sufficient technically capable graduates available to meet its needs, that these graduates value continuing professional development and that they have had sufficient exposure to industry workplaces to ensure they are aware of broader issues such as safety, environmental care and commercial aspects of their work. The Taskforce believes this will require a much greater industry commitment to, and involvement in, education issues.

In response to industry's concerns the National Tertiary Education Taskforce established the following Mission.

*"The Development of World-Class Education for a World-Class Minerals Industry"*

To achieve this mission the Taskforce proposes a way to manage these concerns and deliver the desired outcomes for industry and the community. This Paper considers a broad spectrum of options in which all stakeholders in the minerals sector can have clearly defined commitments and accountabilities.

Following the release of this discussion paper the Taskforce encourages all stakeholders to formally respond. The Minerals Council of Australia will consider these responses, along with stakeholder seminars, in the collaborative development of national recommendations. The Taskforce believes it is essential for all stakeholders - big and small mining companies, the tertiary education sector, industry groups, Federal and State Governments, professionals and students to play a crucial role in setting the direction of the final recommendations.



**R J Carter**

Chairman

National Tertiary Education Taskforce

Minerals Council of Australia

## Acknowledgments

In compiling this discussion paper, the National Tertiary Education Taskforce consulted with a significant number of individuals from within Australian universities, government, professional associations and industry.

The Minerals Council of Australia and the Taskforce wishes to acknowledge the assistance and contribution of all parties who participated in interviews, focus groups and discussions.

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The Broken Hill Proprietary Company Limited

Hamersley Iron Pty Limited

M.I.M. Holdings Limited

Normandy Mining Limited

Powercoal Pty Ltd

QCT Resources Limited

Rio Tinto Limited

Tennent, Isokangas Pty Ltd

WMC Resources Limited

The Taskforce also thanks Professor Alban Lynch and Professor Barry Brady for their valuable commissioned contributions which develop a historical and international picture of minerals education.

The Minerals Council of Australia thanks the Western Australian Chamber of Minerals and Energy for their significant leadership and for the resources it devoted to initiating national discussion on minerals tertiary education in Australia.

# Back from the Brink

## Reshaping Minerals Tertiary Education

### ***The opportunity***

Australia has the potential to be the world's leader in minerals education. University education in Australia is changing, driven by more market orientation, reduced government funding and more flexible delivery of education. The opportunity exists for a true partnership between industry, government and academia to reshape minerals education in Australia and secure the supply of the industry's future specialist professionals.

### ***The threat***

If this partnership does not emerge, the same changes to Australia's higher education that have created the opportunity will exacerbate the shortcomings of an already fragmented and unstable system - possibly pushing it over the brink of viability as a long term supplier of the graduates that Australian industry will need in years ahead.

This will pose severe long term problems to the Australian minerals industry, which already faces a chronic shortage of minerals specialist graduates, especially mining engineers and metallurgical engineers. In the past, shortfalls have been met largely by the leading Schools of Mines in the UK, USA and NZ. However, these schools have dramatically weakened in recent years, and many have closed.

### ***The current situation***

Australia's minerals education system, in its current form, is fragile and is in no position to seize the opportunity, and is more likely to succumb to the threat. Current trends include:

- an acute shortage of talented academic staff, as a result of University remuneration packages having become hopelessly uncompetitive with those in the minerals industry;
- small student populations and high relative costs, making mineral specific courses vulnerable to closures, when Universities are under extreme cost pressures; this situation will be exacerbated if enrolments drop in response to, say, a cyclical down turn in the industry; and
- under-resourcing of minerals departments because of their comparatively small size, making these departments incapable of delivering top class teaching in all aspects of their courses, despite being excellent in some areas.

The Taskforce (and its predecessor Taskforce set up by the WA Chamber of Minerals and Energy) has identified further weaknesses in the present system:

- graduates often have a poor understanding of how their theoretical knowledge can be applied in practice. They also tend to be unaware of the importance of communication and 'people skills', how business decisions are made, occupational health and safety, the demands of life in (often remote) operational settings and other significant issues facing industry;

- industry has a poor record of employing new graduates, with most companies preferring to recruit professionals with some experience. The Western Australian Taskforce survey found that only 16% of responding companies intended to employ new graduates;
- industry uptake of new graduates is profoundly affected by the business cycle. This has established a 'boom or bust' environment for educators, graduates and ultimately, for industry, which is far from optimum;
- industry has been inconsistent and ad hoc in interacting with the tertiary education system. An example of this is the unwillingness of too many companies to offer students opportunities for their mandatory vacation work experience; and
- industry has adopted too narrow and restricted a view of what constitutes an acceptable preparation for a career as a minerals specialist, particularly as a mining engineer or metallurgist. With some important exceptions, this has robbed industry of the opportunity to diversify its sources of graduates and strengthen its standards of competence. It has also restricted an opportunity to make up the frequent shortages of specialist graduates.

### ***A positive vision for the future***

Despite these weaknesses, the Taskforce believes that Australia has the expertise and resources to be the heir to the role once played by leading overseas Schools of Mines. Realising this vision will require a major restructuring of the system in a way that will meet industry's needs for technically excellent graduates and better prepare these critically important people for their careers. The Taskforce believes that the minerals industry must take the lead in this restructuring and go on to become an active partner with universities and government in the new system. It therefore, recommends that:

- (i) an organisation, to be named the Minerals Education Council (MEC), be established by the Minerals Council of Australia to initiate and guide the changes needed for the future and to implement the Taskforce's recommendations;
- (ii) the MEC, in collaboration with participating universities and governments, establishes a network of selected university departments and other bodies which are dedicated to achieving true 'world class' education in the specialist disciplines;
- (iii) the network members are strengthened by programs agreed by MEC and resourced by industry, governments and universities. Industry will also need to contribute concerted and organised non financial support;
- (iv) the network members should be selected on the basis of proposals submitted to MEC by interested universities. Selection criteria will include willingness to collaborate with other universities or organisations to ensure first class coursework delivery, ability to attract first class students, vision and willingness to innovate, research capabilities, quality of academic staff, additional resources needed and how they are to be applied, etc;

- (v) industry broadens its view of what constitutes an acceptable minerals education and establishes alternative pathways for providing appropriate qualifications; and
- (vi) MEC establishes a national school for postgraduate minerals education coursework. This school, to be known as the Australian School of Minerals Resources (ASMR), will be a 'virtual' organisation which will broker coursework programs, from universities and other bodies, to provide:
  - a) conversion courses for non-minerals graduates to support recommendation (v);
  - b) masters degrees by coursework in advanced specialist fields; and
  - c) short courses for continuing professional development.

The network of centres will provide a first class initial degree program as well as being the supporting pillars of the ASMR. The ASMR will also draw on coursework from a wide range of other sources, including private providers and overseas Institutions.

### ***Realising the vision***

Significant further resources will be needed to fund the MEC and through it, the network of centres and the ASMR (which in time will become self funding). The administrative support costs of the MEC are estimated to be \$2.5 million spread over five years. The additional funding for the MEC's programs will not be known until detailed proposals are made by the universities wishing to participate and these are prioritised by the MEC. However, the Taskforce believes that this extra funding could total around \$20 million over a five year period. The industry (including its supporting service industries), universities and government are expected to provide these funds, although a significant proportion could come from the rationalisation of present programs.

The Taskforce therefore further recommends that the minerals industry through the Minerals Council of Australia and government:

- (i) commit to funding the MEC's administration costs to a maximum of \$2.5 million over five year period;
- (ii) agree to provide significant support to implement the MEC's agreed programs;
- (iii) develop a method by which industry, government and universities will each equitably contribute to the cost of implementing these initiatives; and
- (iv) approve specific funding budgets at appropriate intervals to meet detailed programs submitted by MEC within guidelines to be laid down by the Minerals Council of Australia.

The Taskforce's findings, the analysis of them and the detailed explanation of the way in which its recommendations should be implemented are set out in the body of this report and its appendices. The report is commended to the industry, the universities and governments and the Taskforce looks forward to the debate, which it hopes will ensue.

## **Summary of Initiatives, Recommendations and Nature of Change**

It is envisaged that the initiatives, recommendations and the nature of changes will result in an Australian system of minerals education which will serve the industry well into the long term. Without action, the industry will continue to accept what the system currently provides.

### ***Initiatives***

#### ***Initiative 1***

Create a select network of centres and link this with industry. Each member-centre within the network should:

- a) collaborate where desirable with other members to offer a world class minerals program and be able to deliver truly effective and, where necessary, innovative coursework;
- b) have a structured practical experience program;
- c) have an academic staff mix which is able to provide, as a priority, first class teaching, while also maintaining research skills in at least one significant area of the minerals field;
- d) have the commitment and ability to attract talented students;
- e) be located close to a research facility;
- f) have long-term support from their parent university; and g) have the willingness and capability to deliver education to (full-fee paying) international students.

#### ***Initiative 2***

Create a system of alternative educational pathways which ensure that the industry benefits from the great strength and depth of graduates in the wider tertiary education system. Three steps are required:

- a) describe the broad educational preparation necessary for graduates filling the roles of mining engineers, metallurgists and geoscientists;
- b) define a 'road map' of educational pathways into the minerals industry and how they might be followed; and
- c) establish a national network of 'service' courses to support the alternative pathways.

#### ***Initiative 3***

Establish the Australian School of Mineral Resources (ASMR) in order to create a world class centre of postgraduate minerals education. Coursework will cover:

- a) conversion courses for non-minerals graduates to support Initiative 2;
- b) masters coursework in advanced technical areas; and
- c) short courses for continuing professional development.

These courses must be readily accessible to industry through the innovative coursework design and delivery.

## ***Recommendations***

### ***Recommendation 1***

Minerals Council of Australia should establish and fund a new body, the Minerals Education Council (MEC) in order to progress the initiatives recommended in this review. This would include the following steps:

- a) the Minerals Council of Australia develop the charter for MEC and appoint a Chair and Board; and
- b) the MEC to appoint an Executive Director to plan the strategy and resources required to progress the initiatives.

This is to be done within a budget of \$2.5 million over five years.

### ***Recommendation 2***

The Minerals Education Council (MEC) should call for submissions from interested institutions to form a network of centres. These submissions should be made in conjunction with other university departments and minerals companies or industry bodies. The submissions would form the basis of a tendering process, and will result in a collaborative business plan which will be contractually agreed by all stakeholders. Submissions should detail:

- a) how the criteria in Initiative 1 will be met by the proposal;
- b) how they will support the alternative pathways of Initiative 2;
- c) how these centres will contribute to the curriculum of the Australian School of Mineral Resources (Initiative 3);
- d) the timetable for implementation;
- e) the resources universities will commit; and
- f) the resources required from the MEC and a proposal for accessing these resources.

### ***The Nature of Change***

Industry must change by:

- accepting there are limitations to the outcomes that can be delivered in an undergraduate degree course;
- accepting its own need for genuine continuing professional development (CPD) among its employees by establishing structured company CPD programs;
- identifying skills requirements needed from new graduates and implementing the necessary graduate orientation programs to deliver them;
- lessening the cycle of demand for newly graduated professionals by adopting more stable recruitment patterns;
- taking a greater role in the provision of undergraduate practical experience;
- increasing the percentage of companies being prepared to employ new graduates; and
- broadening its view of what constitutes a graduate suitable for a minerals industry career and rethinking recruitment efforts to reflect this.

Universities must change by rewarding behaviour aimed at:

- encouraging cooperation between individual departments both within universities and between universities, to share resources and to develop and deliver world class minerals education;
- encouraging innovation and regular examination of the traditional design and delivery of tertiary education; and
- placing a priority on the development of teaching excellence in tertiary education.

Federal government should assist change by changing the funding framework for higher education to place greater emphasis on:

- improving educational quality by encouraging cooperation and sharing between universities to efficiently utilise public and private resources;
- developing teaching excellence in tertiary education;
- encouraging and supporting student mobility to pursue cost effective and superior quality courses; and
- reducing the administrative burden on universities and rewarding the quality of educational outcomes.

Professional associations must continue to:

- work together to adopt a broader view of the tertiary qualifications and professional experience necessary for roles in the minerals industry;
- focus on systems for continuing professional development management which encourage strong continuous learning beliefs and behaviour; and
- consider whether consolidation or amalgamation of organisations might be in the best interests of minerals professionals and the industry.