

# Submission to the Review of Australian Higher Education

by the

## Australian Society of Exploration Geophysicists (ASEG)

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### Summary

This submission by the ASEG focuses on issues in higher education which we believe are generic to low-volume specialist subjects, such as geophysics, as these are affected by the current funding drivers in higher education.

We identify a need to provide greater support through the higher education Commonwealth fee contribution to providers of specialist courses of high national value. Existing courses are under threat due to low numbers, despite being of national importance. We propose that this can be targeted on a generic rather than subject basis by (a) increased Commonwealth support for lectures delivered through information and communication technology (including necessary adjustment of EFTSL credits between joint providers), and (b) paying the provider an increased Commonwealth contribution in respect of students who are in receipt of an appropriately-designated industry scholarship for living costs. These mechanisms will result in an industry-government-university partnership producing needs-driven output of professionals educated in key specialist disciplines.

### Background

The measurement of rock, earth and water physical properties (such as magnetic properties, sound-wave characteristics, electrical conductivity) plays a vital role in Australia's mineral, petroleum and water exploration, extraction and management processes, civil engineering operations, geothermal energy development and natural hazard monitoring functions. The measurement science is called geophysics, and has been a specialised part of geosciences and physics education in Australia for 50 years. The Australian Society of Exploration Geophysicists is the professional society representing a membership of 1,329 students and practising professional scientists using geophysical methods.

It is paradoxical that the teaching of geophysics in Australia has undergone a major decline in the last decade<sup>1</sup> in the lead-up to the current resources boom which has lifted demand for geophysicists to record high levels. The decline of the wider geoscience programmes in

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<sup>1</sup> There has been a reduction from a total of eleven geoscience departments offering an undergraduate major in geophysics, to four departments only, in 2008

universities in the country has been previously quantified<sup>2 3</sup>; a current study focussing on the specific discipline of geophysics shows a sharper decline in this specialist area<sup>4</sup>.

## Consideration of Questions

The issues are addressed here in the context of selected questions put by the Review's Discussion Paper<sup>5</sup>.

### Section 3.1 Meeting labour market and industry needs

Question:

2. Are there impediments to the higher education sector being able to innovate in the development of courses and programs? What are these impediments and how could they be removed?

The impediment to innovation in geophysics courses is the current situation where student numbers (EFTSL) are the driver determining revenue and hence priority for Australian higher education providers (in this case, the universities). Geophysics courses are specialist, low in student numbers, but of high importance to a key professional group involved in Australia's resources boom.

Most 'geoscience degrees' are uneconomic on a purely teaching basis because of the combination of the numbers of students and student funding, together with the staffing levels required to deliver a well rounded Tertiary geoscience education (Reference - AGC Higher Education submission).

A logical innovation would be for universities in the same cities to share teaching resources enabling a comprehensive degree to be presented to all geoscience students in that region or for universities or allow students to move easily between universities to enable them to follow their preference for particular degree. However it is quite clear that the competition for students and the inadequacy of student funding stands in the way of cooperative activities between institutions and innovative ways of addressing fundamental structural problems.

Innovations in information and communication technology (ICT) have the potential to assist e-learning of specific components of minority discipline courses through inter-university collaboration. It is very regrettable that the current funding model acts as a direct deterrent to such collaboration, by delivering a strong incentive for the selfish containment of EFTSL-paying student numbers. Economically important specialist sub-disciplines such as geophysics, hydrogeology and metallurgy are not taught in many universities, due to the inability of the institutions to support educators in such specific fields. However, highly skilled educators are in fact employed at other universities. Industry experts may also

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<sup>2</sup> AUSTRALIAN GEOSCIENCE TERTIARY EDUCATION PROFILE  
2007, January 2008, Australian Geoscience Council

<sup>3</sup> Towards a National Tertiary Geoscience Education System - invigorating university geosciences:  
A Discussion Paper, February 2008, Australian Geoscience Council

<sup>4</sup> Review of Geophysics in Australian Universities, for the Minerals Council of Australia, July 2008.

<sup>5</sup> Review of Australian Higher Education - Discussion Paper, June 2008. Available via the DEEWR website at:  
<http://www.dest.gov.au/HEreview>

contribute in emerging fields. The sharing of educational capabilities is a very obvious mechanism for upgrading the educational of Australian graduates. This may be achieved readily by the collaborative delivery of courses using modern ICT systems, except that the current tertiary funding arrangements preclude such collaboration. It is recommended that the Federal Government takes proactive measures to encourage such ICT collaborative teaching, building on existing multi campus lecture capabilities such as the Access Grid technology used in the Monash University Faculty of Science.

**RECOMMENDATION: The Commonwealth Government should fund the development of collaborative educational capabilities using state of the art ICT systems, which would ensure wide delivery of key sub-discipline courses including geophysics, with particular focus on sustaining the existence and the effectiveness of minority disciplines at regional tertiary institutions.**

3. What are the appropriate mechanisms at the national and local level for ensuring higher education meets national and local needs for high level skills? What is the role of state and territory governments in this area?

A national mechanism increasing the Commonwealth contribution per EFTSL for student places in high demand is a necessary step towards making specialist courses financially viable in Australian universities. The present arrangements fund places at a constant amount per annum for an individual discipline cluster throughout a course. In the light of the experience in geosciences, this discriminates against low volume courses with high resourcing complexity in terms of teaching specialities, laboratories and fieldwork requirements. The ASEG supports the AGC proposal that funding arrangements should be changed to recognise the actual cost of teaching of science disciplines and also the progressive increase in costs of teaching and teaching resources as students move through a course of study towards a major/honours degree. The AGC proposes that the university funding should comprise a base level (block funding) determined by the real costs of course delivery, plus a per student rate based on EFTSLs.

4. How adequate are the mechanisms for aligning supply and demand of graduates? How do pricing and labour market signals impact on student choices?

The current National Priority mechanism affects the cost to the student, **but it does not facilitate provision of the course of study**, since it does not adequately fund low-number specialist courses of high national importance.

5. Are there particular examples of good practice where you can demonstrate either rapid response to skill shortages or successful initiatives to improve generic skills?

A specialist MSc by coursework which was offered by the (now closed) CRC for Australian Mineral Exploration Technologies 1992-2000 is a successful example of a program providing up-skilling for geophysicists employed in industry, through a course of study led by both university academics and qualified specialists seconded from industry.

6. How effectively are Australian higher education institutions responding to demographic change, especially in providing lifelong learning to meet the challenge of the ageing population and the need for upgrading of skills and re-training?

In geophysics, the response to demographic change is weak. Throughout Australia, the dominant theme is a reduction in geophysics courses on offer. Current plans for innovation and expansion<sup>4</sup> (UWA, ANU, Monash) cater to petroleum and solid-earth studies rather than mineral geophysics, engineering geoscience, hydrogeology and natural hazard monitoring.

7. What is the relevance and applicability of the findings and approaches proposed in the United Kingdom paper, Higher Education at Work, for increasing skills levels in the workforce to Australia?

Two points quoted from the Review Discussion Paper in particular are relevant to the teaching of geophysics in Australia.

“The [ UK study] paper suggests that higher education providers develop new ways of working to meet the needs of employers and employees, and suggests ways to encourage employees to upgrade their skills, including the use of Foundation Degrees; accreditation of employers’ in-house training by higher education institutions;” (from <sup>5</sup>, page 24 box).

The proportion of Australian geophysics graduates completing four or more years of study is expected to make this need acute. It is the established view of professional societies that a four-year honours degree or equivalent is the desirable minimum professional education for scientists. However in the resource industry there is now strong competition for graduates, with consequent high incentives for 3-year science graduates to enter the work-force, and the four providers<sup>6</sup> of geophysics majors provide 2008 statistics<sup>4</sup> showing a combined 62 students enrolled in a geophysics major, compared with only 21 enrolled in honours. This suggests the conversion rate from the basic BSc to the desirable professional qualification is about 35%, a low percentage which is contrary to the professional requirement. As a consequence we expect that over the next five years there will be a strong demand by employers and/or employees in the resource industry for up-skilling courses, whether graduate diploma, Master’s degrees, or industry in-service training courses.

A recently-concluded example of a provider meeting the specialist needs of an employer is an MSc by course-work program offered by ANU, principally at the request of Geoscience Australia (GA), for the purpose of up-skilling GA employees. While the program is regarded as successful in its input to students, there are continuing concerns in the university as to whether it is sustainable in its present form because the cadre of only 5 students in the course does not allow the provider to cover the costs of running the courses. The future of the course (2009 program) is undecided at this time of writing.

“It will develop a new funding model which involves co-financing of higher education with employers” (from <sup>5</sup>, page 24 box).

This is another key issue for geophysics teaching since a dual need is apparent, firstly for incentives to students to enrol in the program (probably via industry scholarships), **and secondly for incentives for the provider** to offer the specialised program to relatively small student groups (arguably best achieved by increasing the Commonwealth contribution in respect of such courses).

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<sup>6</sup> Adelaide, Curtin, Macquarie and Tasmania

### Section 3.8 Resourcing the system

Questions<sup>5</sup>:

28. What incentives or unintended consequences are there in the current arrangements for higher education funding?
29. To what extent are the current funding models adequate to secure the future of Australia's higher education sector? If there are better models, what are they?
30. Are the current institutional arrangements for determining relative funding between higher education institutions appropriate? If not, what changes should be considered?

The discussion Paper includes the comment:

International and domestic student numbers are the key drivers of revenue for higher education institutions.

This is a key issue in the availability of numerical and physics-based geophysics courses nation-wide. Every university contacted has reduced course offerings, even where a geophysics major is still offered. This is due to institutional pressures to discontinue courses having typically fewer than 10 students. Whether intended or not, current arrangements are stifling the development and teaching of specialist skills which happen to be vital to Australia's resource industry.

A better model, which combines industry incentives to potential students (via scholarships) with selective increased Commonwealth incentives to universities using a generic formula, is described as follows.

#### **A proposal to facilitate recruitment and education of specialist professionals via Industry and University partnerships**

**RECOMMENDATION: The ASEG proposes that undergraduate students in designated faculties or technologies, who are recipients of industry scholarships, have their core-funding contribution to the university (Commonwealth contribution amount per EFTSL), paid at a higher level than that for non-scholarship students, of order 50% as discussed below.**

#### **Advantages:**

- a) it is generic, requiring only evidence of a scholarship (probably at or exceeding some defined level of subsistence support) in order for the higher Commonwealth contribution to apply,
- b) the principle already exists, at least in higher degree enrolments where foreign students holding fee waivers are weighted differently to fee-paying students in counting Commonwealth contribution,
- c) it is market driven - industry scholarships will only exist in the areas of need,

d) it will support small student numbers - universities will be better able to offer specialist courses if a significant number of students in the courses are of increased value in Commonwealth contribution.

There may be a need to apply some filter to restrict eligibility to broad professional or technological areas - this might be done simply by use of the existing category of National Priorities which is used to apply an adjustment to Student Contribution amounts, or the filter could be based on "faculty designation" eg science and engineering faculties. Or it might be linked to existing tables of professional areas of demand as established for weighting immigration applications.

A key feature of this proposal is that it not only recognises the concept of National Priority (already a part of the existing funding formula for university teaching), but it also recognises the need **and provides a generic mechanism for providing the necessary funding to university teaching departments**, to enable specialist courses with low numbers but high importance to be offered.

The concept of National Priority is already established in the funding formulas for higher education, but the National Priority classification currently (2009 tables) has the effect of reducing the Student contribution and increasing the Commonwealth contribution by the same amount.

For example, a full-time science student in 2008 (without benefit of the National Priority classification) provides revenue to the higher education provider of \$14,363 (Commonwealth) plus \$7,260 (Student).

A full-time science student in 2009 (under the new National Priority classification) provides revenue to the higher education provider of \$17,914(Commonwealth) plus \$4,162 (Student)<sup>7</sup>.

While the reduced student contribution under the 2009 National Priorities list is valuable in assisting the student, it does nothing to assist the higher education provider in respect of the cost of offering specialist courses to low student numbers in the areas of national need.

Engineering and science enrolments receive a Commonwealth contribution of \$14,363 (2008), compared with which Agricultural Science student enrolments receive \$18,227 (2008), a \$3,864 increase.

Whether this level of increase in funding for geophysics or other courses related to areas of national need, would prove sufficient incentive to allow higher education providers to provide the necessary specialist course units (say to groups of average 7.3 students, instead of the current often-quoted minimum of ten students), needs to be investigated further. Only a fraction of students in a given course would be expected to hold an industry scholarship, which may provide a further limitation on the effectiveness of the incentive to the higher education provider.

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<sup>7</sup> Tables 1,2, 4, 5 of "What you pay" at <http://www.goingtouni.gov.au/Main/FeesLoansAndScholarships/Postgraduate/CommonwealthSupportForYourPlaceAndHECS-HELP/WhatYouPay.htm#T2>

It is arguable that an industry undergraduate scholarship would need to be pitched at order half of student subsistence cost of living, currently estimated for example minimum \$7,200 for home board, or \$19,800 pa (hostel)<sup>8</sup>. Using a figure of say \$7,000 pa as the minimum viable industry scholarship level capable of attracting the desired student interest, then we propose that it is desirable from the stand-point of the higher education provider that a matching government contribution of \$7000 be made in the form of an additional Commonwealth contribution. This would be equivalent to a loading on the basic Commonwealth contribution of 50%.

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<sup>8</sup> University of Melbourne Wellbeing Services,  
[http://www.services.unimelb.edu.au/finaid/planning/cost\\_of\\_living/summary.html](http://www.services.unimelb.edu.au/finaid/planning/cost_of_living/summary.html)