



review of

teaching and teacher education

Discussion Paper:
Young People, Schools and Innovation:
towards an action plan for the school sector

**Committee for the Review of Teaching
and Teacher Education**

March 2003

an initiative of

Backing
Australia's
Ability

The Commonwealth Government's
Commitment to Innovation



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ISBN 1 87703256 5

ISBN 1 87703257 3 (Electronic version)

DEST No. 7034SCHP03A

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INTRODUCTION

The Review of Teaching and Teacher Education

One of the long-term strategies in the Government's \$3 billion innovation statement *Backing Australia's Ability*¹ which was launched by the Prime Minister, is to increase the numbers of talented people that are attracted to teaching as a career, especially in the fields of science, technology and mathematics education. To implement this strategy, a Review of Teaching and Teacher Education is being conducted in consultation with State and Territory governments, with a particular emphasis on science, technology and mathematics, in order to identify the skills and support needed by teachers to build a culture of continuous innovation at all levels of schooling in Australia.

A Review Committee chaired by Professor Kwong Lee Dow, Deputy Vice Chancellor of the University of Melbourne, and with a membership drawn from school, higher education and industry sectors, has been established to conduct the Review. A broad-based Reference Group has also been appointed to assist the Review Committee by providing guidance with the consideration of issues raised during the Review. The membership of the Review Committee and Reference Group are at Attachments A and B, respectively.

In accordance with the Terms of Reference (at Attachment C), the Review, in relation to innovation, will:

- draw upon recent literature and initiatives to describe the teaching skills needed to develop a culture of lifelong learning and innovation in Australia's school students;
- map current skills and propose strategies for equipping teachers with the knowledge and skills to create an innovative learning culture amongst their students;
- explore the impact of innovative pre-service and in-service education programmes on the development of teachers' pedagogic practices to enhance their students' appreciation and capacity for learning, creativity and innovation, with particular emphasis on the fields of science, technology and mathematics; and
- produce an innovation action plan for the school sector, by mid 2003.

The Review Process

Phase One

The first phase of the Review focussed on issues related to attracting and retaining teachers of science, technology and mathematics. Following the release of a Discussion Paper and call for submissions, the Review Committee produced an Interim Report, *Attracting and Retaining Teachers of Science, Technology and Mathematics*, for the Minister of Education, Science and Training, the Hon Dr Brendan Nelson MP. This report is available on the Review's website at www.dest.gov.au/schools/teachingreview and hard copies can be obtained by telephoning 02 6295 8481 or by e-mailing teachingreview@secretariat.com.au.

Phase Two

The second phase of the Review is now underway and will focus on developing an innovation action plan for the school sector. The final Report for the Review, which will be produced by mid 2003, will encompass phase one and phase two of the Review.

Purpose of the Discussion Paper

This Discussion Paper, *Young people, schools and innovation: towards an action plan for the school sector*, is intended to stimulate thinking about the issues relevant to the second phase of the Review and provide the basis for comment on two broad objectives that the Review Committee considers to be of paramount importance in preparing students for productive lives in the knowledge economy of the 21st Century.

These are:

- developing an innovative capacity in students; and
- developing a culture of innovation in schools.

This is consistent with the *National Goals for Schooling in the 21st Century*² which recognise that one of the roles of schooling is preparing young people for culturally rewarding and productive lives. These goals outline the broad knowledge, understanding, skills and values Australian students need for a productive life. In this context a number of States and Territories have identified essential learnings, 'new basics' and key skills, and schools and teachers are already working towards these objectives, though across the board, it is not necessarily at optimal levels. The Committee is keen to recognise success and is seeking examples of successful approaches to developing innovative capacity in students and a culture of innovation in schools.

If innovation is to be more actively pursued in schooling today, it is necessary to identify more explicitly:

- what the appropriate knowledge, skills and attitudes are for students;
- what needs to be modelled and taught by schools, teachers and others; and
- what priorities need to be developed, supported and evaluated collaboratively.

These issues around what students learn and the learning environment go to the heart of young people's learning and to supporting structures and processes in schooling, including teacher education, school organisation and leadership.

This paper seeks information and comments on the implications of innovation for student learning, teaching, teacher education and professional learning and development, school organisation and leadership at all levels and is organised under the following headings:

- Learning in a culture of innovation;
- Developing a culture of innovation in schools;
- Teacher preparation, professional learning and development in a culture of innovation; and
- Leadership at all levels.

There are varying perspectives on innovation. For example, the Government's statement on innovation *Backing Australia's Ability*, states:

Innovation is the process by which new ideas are transformed, through economic activity, into sustainable, value creating outcomes—into tradeable products, processes and services.³

Australia's Chief Scientist, Dr Robin Batterham, states:

Where knowledge is an essential ingredient, innovation is the activity that utilises that resource. As sunlight is to photosynthesis, knowledge is to innovation. Innovation is the process that translates knowledge into economic growth.

Innovation is much more than invention or R&D. It encompasses all activities encouraging the commercialisation and utilisation of new technologies—scientific, technological, organisational, financial and business.⁴

And a view from a school perspective is that:

... innovation is mostly 'bottom-up' and small-scale, it is what the imaginative and responsive school does when it encounters problems and challenges or when it thinks out a different and potentially better way of doing something that has become staled by custom or tradition.⁵

The Committee recognises that it is important to include in our understanding of innovation, the broader social and cultural dimensions including the creative endeavours, experiments, organisational changes and other forms of adaptation and flexibility in the everyday life of schools. If well managed, they contribute to awareness that change is functional and positive, and that disruptions and problems are challenges to be met in constructive ways, rather than be avoided.

The Committee will develop an innovation action plan for the school sector. This will build on information about what is currently working and views on what now needs to be done. Submissions will provide a rich source of ideas and information for consideration by the Review Committee.

How to Prepare Submissions Relating to this Discussion Paper

Comments on the series of important issues and key questions raised in this Discussion Paper are invited from individuals and organisations through a formal process of written submissions to the Review Committee. Some organisations and individuals may want to confine responses to particular questions or issues.

To make submissions most useful we ask that you include a summary at the front. If possible please provide submissions by e-mail or on computer disk (include a hard copy). Electronic submissions need to be saved in a Microsoft Word document or Portable Document Format (PDF). Otherwise please type or write clearly in black ink on A4 paper. Please do not bind your submission with a spiral or comb binder. Only the original is required; additional copies are not required.

Ensure that you sign the submission. E-mailed submissions must include your name, phone number and postal address so we can verify them. If the submission is from an organisation, please indicate this clearly. Include the signatory's position, and at what level the submission was authorised.

Unless you request that your submission be treated confidentially, it will be made publicly available on the Review Website or on request. Authorship will be acknowledged. The Department reserves the right in its absolute discretion to determine whether submissions will be published.

If you wish your submission to be kept confidential, please indicate clearly at the front of the submission, or in a covering note. If you want part of the submission to be confidential, please mark it clearly and put that part on a separate page(s). The Secretariat will endeavour to keep such submissions confidential unless required to do otherwise by the operation of any law, judicial or Parliamentary body or governmental agency. The Secretariat can therefore give no undertakings to keep the information confidential or ensure that you will be protected from future legal action. If you have any concerns about this, the Secretariat suggests that you should seek your own legal advice.

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Submissions may be edited for the purposes of publication. For example, if a submission contains numerous attachments, the attachments may not be included on the website. If you do not want your submission to be edited, please state this clearly at the front of the submission or in a covering note.

Information contained in the submissions is collected for the purpose of the Review of Teaching and Teacher Education. The information collected will be used only for the purpose for which you provided it, and, except as set out above, it will not be disclosed without consent unless where authorised or required by law.

Acknowledgement of submissions will be sent within five working days of receipt. If you do not receive acknowledgement, please telephone 02 6295 8481.

Submissions can be forwarded electronically to:

teachingreview@secretariat.com.au.

or sent by post to:

Review of Teaching and Teacher Education
GPO Box 3318
MANUKA ACT 2603

The closing date for making submissions in relation to this Discussion Paper is
4.00 pm, Friday, 2 May 2003.

This Discussion Paper and other information relating to the Review of Teaching and Teacher Education can be obtained from the Review website: www.dest.gov.au/schools/teachingreview.

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YOUNG PEOPLE, SCHOOLS AND INNOVATION

A complex and dynamic context for learning and teaching

As society becomes more complex so do the challenges we face. Australia's capacity to meet challenges will hinge on its capacity to develop innovative solutions; the ability not just to solve problems but to solve them in ways which break boundaries and build something new and beneficial which enhances the quality of life for all citizens. This means that innovative solutions will need to be socially and culturally, as well as technologically and industrially relevant. In an increasingly competitive global market, a small nation such as Australia will need to harness more effectively the innovative potential and creative energies of its people if it is to maximise its competitive advantage.

The achievements and successes of students and their teachers in our schools are important for our continuing growth and well-being as a nation. Personal fulfilment and active purposive learning are vital for all students, providing the impetus for individual initiative, team work and a sense of shared responsibility. Our schools have demonstrated immense capability and adaptability and there are innumerable proven examples of innovation to meet changing needs and expectations. While celebrating progress and many achievements, we need to look to the future.

Governments see public investment in education as being directed towards a wide range of individual social and economic goals. In particular, the development of a well-educated, flexible, responsive, creative, self-confident and adaptive population is recognised as the key to achieving economic prosperity, and social and civic engagement.

In member countries of the Organisation for Economic Cooperation and Development (OECD), schools are being asked to provide students with a renewed kind of liberal education, with emphasis on defined standards and new skills. Attitudes and competencies which encourage adaptability, flexibility, self-reliance, teamwork and innovation are now promoted among the qualities required for contemporary workplaces and society more broadly.

A fundamental question being asked as part of this process is how schools can best develop, in all students, a capacity to innovate, to be creative and to take greater control of their lives. Post-industrial nations are implementing policies to build innovative capacity in their economies. This is the broad thrust of *Backing Australia's Ability*, the Australian government's innovation action plan and its subsequent report, *Backing Australia's Ability Real Results Real Jobs*, which recognises that "an ideas culture needs skills development, a scientifically aware population and an environment that supports the innovation process".⁶ Education has much to contribute, both in what and how students learn and in the adaptability and flexibility of institutions such as schools, colleges and universities, together with new ways of arranging adult and continuing education throughout each individual's life.

Schools can play many roles in this process. This may involve questioning of accepted structures—current school organisation, curriculum and pedagogical approaches. How schools as workplaces can become more flexible in their operation, and how the roles of teachers and students in the teaching and learning process should evolve to keep pace with changing demands, are questions that need to be addressed.

Australia has a robust education system that has served it well since the emergence of mass secondary education. Australian schools are changing to develop new skills, attitudes and competencies in their students. Many Australian schools and Australian teachers are already highly innovative in practice. Can this willingness to innovate be translated into a widespread culture of innovation among Australia's young people and within Australia's schools?

The impact of information and communication technologies

The pervasive influence of information and communication technologies (ICTs) on these drivers of change is patent. Computers, radio, television, DVDs, film and the internet have transformed communities and the lives of individuals. Cultural and economic production, trade and the work of business and government have become ever more dependent upon knowledge, information and innovation.

By the end of 2000, 40 per cent of Australian households were connected to the internet and most accessed it at least once a week. Twenty-two per cent of children aged between 5 and 8 accessed the internet in the 12 months to April 2000, and 72 per cent of those aged between 12 and 14 did so over the same period. Sixty per cent of businesses were connected to the internet by the end of 2000—in the case of small businesses, there was an increase from 24 per cent to 50 per cent in only two years. Sixty-five per cent of the Australian population aged 16 and over had internet access at the end of 2000, the sixth highest proportion of the population worldwide.⁷

Many organisations and institutions are transforming the way they work in response to ICT and the broader requirements for access to information. For example, libraries, as important cultural and learning institutions, are moving away from being book depositories to becoming information managers. They now enable greater access to information and provide new uses for it, creating new demand for their services. University libraries are at the forefront of this change. The University of Queensland, for example, has halved its print journal collection in favour of e-journals which now number over 16,000. Easy internet access has created expectations in the community at large that information will be easily and freely available in print, on video or online. There are, however, wide disparities in practice which schools and other educational institutions can help to address through community outreach activities.

Within schools, it is becoming the norm for students to be confident and productive users of new technologies, particularly ICTs. Students and teachers together are harnessing the new technologies—in experiments and applications in science, in design, craft and technology classes, in planning field excursions, research for projects

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and in homework and other out-of-class assignments. Integrating information and communication technologies into their operations as tools to improve student learning outcomes, to offer flexible learning opportunities and to improve the efficiency of their practices continues to be important.

Expectations of schooling

Broad community attitudes towards, and expectations of, schooling are centred on quality, equity and accountability and the full, active engagement of all young people in the learning process. Parents, business, industry and the wider community are especially concerned that within a well-rounded education, every child is taught to master basic skills (numeracy and literacy). More than that, parents expect schools to address holistically the learning needs of their children and to equip them to participate fully in democratic society. Parents generally have high expectations of schools and are increasingly exercising choice in where they send their children to be educated formally. Parents expect schooling to be much more customised than in the past and overwhelmingly want to be kept informed and involved with their children's school activities.⁸ Schools are developing stronger links with parents and community bodies and with business and industry, often using ICTs to enhance communication.

Business and industry expectations are actively shaping the broad goals and purposes of schooling. Over the past decade, the business community has shown a growing interest in the outcomes of schooling and in direct involvement in schooling. This interest includes, but goes beyond, vocational education and training in schools. Moves to incorporate vocational preparation are exerting a powerful influence on education policy developments across the country. Many schools are developing broad, vocationally-oriented programs as a means of strengthening students' interest in learning. In 2001, nearly 95 per cent of schools with senior secondary school programs were offering vocational education and training programs and some 169,800 students participated in vocational education and training as part of their secondary schooling.

As business and industry have grappled with the changing nature of the workplace they have identified new types of skills needed by people to continuously adapt and upgrade their knowledge and skills. Business and industry emphasise the importance of young people being able to transfer their knowledge and skills to different learning areas and situations, and for a solid foundation for lifelong learning to be laid in schools. Several changes of career during their working lives is the reality facing increasing numbers of people, hence the importance of generic competencies and a readiness to continue learning. The *Employability Skills for the Future* report developed by business and industry sets out a framework that incorporates the personal attributes and skills that employers expect young people to have developed through their schooling before they enter the workplace.⁹ Personal attributes such as loyalty, commitment, honesty and integrity, enthusiasm and adaptability and a set of key skills that build on the Key Competencies¹⁰ all contribute to employability and the overall development of people. The set of employability skills include:

- communication skills that contribute to productive and harmonious relations between employees and customers;
- teamwork skills that contribute to productive working relationships and outcomes;
- problem-solving skills that contribute to productive outcomes;
- initiative and enterprise that contribute to innovative outcomes;
- planning and organising skills that contribute to long-term and short-term strategic planning;
- learning that contributes to ongoing improvement and expansion in employee and company operations and outcomes; and
- technology skills that contribute to effective execution of tasks.¹¹

Increased mobility in the labour market makes the acquisition of these skills essential for young people. Such skills enable people to change careers readily and adapt effectively to changed circumstances. These skills, by their nature, cannot be acquired solely at school and rely on effective partnerships between schools, parents, business, industry and the community.

Clearly, the focus of learning in 21st Century Australian schools has broadened. As well as an explicit focus on knowledge and standards, recently more attention has been given to equipping students with work and life-related skills, attitudes and values, and a sense of community responsibility. This extensive repertoire is demonstrated in social and civics education, vocational and enterprise learning, and the uses being made of ICTs—altogether a wider set of attributes that responds to new requirements of the knowledge society and economic and environmental sustainability. At the Commonwealth and State and Territory levels, a range of initiatives has been put in place to help develop these broader capacities and support schools in offering broader learning experiences.

Students' perspectives are also changing. The stimuli and the experiences young people have outside school are increasingly sophisticated and fluid—their informal learning is now much more ICT dependent and more heavily influenced by a global culture than was the case with their parents and teachers. Many students work part-time while at school. Some (about 5,700 in 2001) are engaged in school-based New Apprenticeships programs and vocational education and training programs which bring them into regular contact with the expectations and demands of the world of work. Students also participate in voluntary organisations, sporting and recreational groups and in community development activities. As a result of the combined impact of all these factors, young people are increasingly seeking relevance and connection between what they can do and learn outside school and what they do and learn about in the classroom.

The composition of the student population is more culturally diverse and, in terms of the total cohort of young people aged under 19 years of age, is quite different from the recent past. As recently as 1982, the apparent retention

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rate from Year 7/8 to Year 12 was around 36 per cent. By 2002, the rate had more than doubled to 75 per cent.¹² Policies are in place to improve participation rates still further but their success depends on innovations—in curriculum, school organisation, pedagogy—to provide a valuable experience for an even broader cohort of young people.

There has been a dramatic increase in enrolments in all forms of tertiary education as more people—school leavers and mature age adults—seek to strengthen their capacities and formal qualifications. Changes that have occurred to post-compulsory school participation in the past twenty years are largely a response to the changing labour market, including new career pathways and requirements for a more highly skilled and better-prepared workforce. Social changes such as the gender composition of the workforce, diverse family structures, and increased geographical and social mobility have also had an impact on students over the last generation.

These changes have generated considerable challenges for schools in responding to the complex and diverse learning needs of students and providing a range of study pathways for them to follow through and from school.

Innovation and the changing role of schooling

The ability to innovate is emerging as one of the key capabilities of the knowledge economy and information society for individuals and, indeed, the whole community. At the national level, it is now widely accepted that innovation is a key requirement for future prosperity.¹³ Governments all over the world are actively supporting and nurturing the development of their science, engineering and technology base to build an innovation capacity in business and industry. The 1995 European Commission *Green Paper on Innovation*, the 2001 United Kingdom *White Paper on Enterprise, Skills and Innovation*, the 2002 Canadian *Innovation Strategy* and Australia's statement on innovation, *Backing Australia's Ability* all recognise the fundamental role of knowledge and people in future economic success and social well-being. *Backing Australia's Ability* recognises that Australia's capacity to remain internationally competitive over the next decade will depend to a large extent on the way in which research, development and innovation are developed and supported by government, industry, community organisations and, most importantly, by the education sector.

At the broadest level, innovation is commonly seen to be about generating new ideas and bringing them to life as new products, processes and services for commercial use or social well-being. There are many levels and forms of innovation—it is not just one kind of socio-economic process, but a wide variety of interactive forces. Innovativeness is a cast of mind, a way of perceiving and responding to the world we live in, as much as it is a clearly delineated set of actions in a specific setting. Innovation “is above all a social phenomenon. Through it, individuals and societies express their creativity, needs and desires. By its purpose, its effects or its methods, innovation is thus intimately involved in the social conditions in which it is produced”.¹⁴ As well as studies of science, technology and mathematics, studies of the arts, social sciences and humanities have a large part to play in contributing to our innovation capacity and growth as a prosperous democratic society.

The science, engineering and technology base of the economy is well recognised as a building block of the nation's innovation capacity. Currently major work is underway at the national level to map progress in science and innovation.¹⁵ It will focus on Australia's science, technology and innovation in terms of resources, players, linkages and performance. The links between those macro-level changes and imperatives and schooling practice need to be more actively considered by schools, teachers, education authorities and governments.

The development of an innovative culture in schools is not confined to the teaching and learning of science, technology and mathematics. The changes that are being demanded of people, organisations and systems extend throughout the whole of society. Increasingly, societal advances are being built on complex interdisciplinary understandings and a range of human endeavours that encompass the arts, the humanities, science, mathematics and technology. These connections are integral to our understandings of what it is to be an active citizen in a democratic society.

Our success as a society and our competitiveness as an economy is based increasingly on people rather than physical resources. Consequently, a premium is placed on people's capacity to adapt, be creative and confident, flexible and self-reliant. Readiness for lifelong and lifewide¹⁶ learning is as necessary a foundation for life as is literacy and numeracy. As schools engage with the knowledge society, they must also engage with others—students, parents, communities, business and industry—through partnerships, to ensure their continuing effectiveness, relevance and interest to young people.

Young people, schools and teachers need to understand why innovation is important and, ultimately, to embrace and shape the challenges that present themselves. Governments have important contributions to make. The *Smart State* initiative in Queensland and the *Schools for Innovation and Excellence* initiative in Victoria, which is designed to assist schools to make these connections and reorient their organisational structures, curriculum and pedagogy, are examples of leadership in this area.

Governments, business and industry, professional, industrial and other educational organisations are embracing the new imperatives. Schools, teachers, young people, parents and communities have shown initiative in positioning both formal and informal learning to respond to changes in our society and to equip students themselves as future agents of change. As education at all levels becomes ever more closely connected with our well-being, we must continue to question our practices and extend the range of our successes in teaching and learning.

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Considering the connection between schooling and innovation of different kinds and levels, what actions are likely to be effective in anticipating the needs of students and teachers in the knowledge economy and information society?

Key questions

- 1.1 What are the characteristics of innovative organisations/cultures that are able to successfully develop a capacity for innovation?**
- 1.2 What is schooling's role in promoting an innovative learning culture and in fostering creativity? What is needed to encourage a culture of innovation in schools?**
- 1.3 What practical activities to support the development of a culture of innovation in students are happening in your school and community? How can we best promote and disseminate good practice in this area?**

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CHALLENGES

Learning in a culture of innovation

As we have already seen, the term ‘innovation’ covers a broad range of activities. From a school perspective, and in the context of a knowledge society, Australia’s Chief Scientist’s description of innovation—as an activity that utilises knowledge—is a good starting point (see page 3). Schools have always been in the business of utilising knowledge and constantly face the need to keep abreast of changing knowledge and broader contexts of knowledge use and application. As the rate of change increases and the scope of application widens, especially for advanced knowledge, schools must find new ways of educating students. Government and non-government education authorities, teacher educators, the teaching profession, parents and the wider community all have parts to play in supporting schools and teachers, and in building their capacity for managing and guiding change.

New ways of generating, diffusing and using knowledge within the construct of a knowledge society are transforming what we expect from schooling, what students need to learn and how we need to approach teaching in this context. At all levels, the knowledge society demands highly creative, thinking individuals able to communicate well and adapt to change. Remaining motivated when faced with difficult circumstances and finding solutions to problems as they occur, are also key attributes that can be broadly organised under the umbrella of *developing an innovative capacity*.

We should keep in perspective the numerous and varied requirements and expectations of schooling. As part of their basic education students require deep knowledge across a range of learning areas and broad literacy, numeracy, scientific and technological skills. Interpretive skills and a variety of communicative and social skills are also fundamental. The concept of a broad, general education for personal growth and social participation must be balanced by the requirement for sound vocational preparation.

Schooling is not the end, but the introduction, to a lifetime of learning. Since learning in a knowledge society must continue throughout life, it will be accumulated from a wide range of sources both formal and informal. The development in students of a broad range of knowledge, skills, attitudes and values that were not, even ten years ago, explicitly required outcomes of schooling places an onus on schools to be alert to the significance of social and economic change as well as to developments in the subjects and areas of knowledge for which they are directly responsible. For instance, there is renewed interest in applying learning theory, focussing on thinking skills, ‘learning to learn’, and meta-cognitive awareness, so as to equip students to continue to learn throughout life.

Educators are suggesting that the knowledge society demands greater emphasis on skills such as problem solving, lateral thinking, breakthrough thinking¹⁷ and wisdom. These attributes, and ways to develop them, need to be made explicit (for example in curriculum designs and modules, pedagogical practice, professional development programs and teacher education). Existing approaches need to be re-evaluated and renewed.

Key questions

Given society's changing expectations of schooling and the factors that are changing school practice:

- 2.1 What are the knowledge, skills, understandings and capabilities needed by students to develop an innovative capacity? What changes are occurring (and need to occur) in early childhood education, primary education, the middle years and secondary education?**
- 2.2 What do we know from research and practical experience that will help us to better prepare teachers to develop an innovative capacity in school students?**
- 2.3 What examples are there of good practice in any of these domains, including formal evaluations?**

Developing a culture of innovation in schools

The learning needed by students to acquire and develop an innovative capacity cannot simply be bolted on to existing curriculum, school organisation and pedagogy. Adding new requirements for schools, within the current way schools are organised, is already causing concern for schools and teachers. Moreover, the necessary student learning outcomes would be difficult to achieve without consistent approaches to curriculum, and an examination of school organisation and pedagogy. For example, developing flexibility, adaptability and initiative requires a much broader set of learning opportunities, and complementary pedagogy. This may require:

- schools to increasingly examine learning outcomes and their approaches to preparing young people for the next phase of their lives;
- encouraging students to seek out challenges, and apply their skills and knowledge and that of their peers in solving problems they are likely to encounter;
- new approaches to assessment; and
- new kinds of feedback to students on their performance and to parents and families on their role in supporting and encouraging student learning.

Some schools will need to change themselves root and branch, while others will need to find ways to maintain a momentum that may be waning as they cope with present demands. All schools will wish to build on the good things they currently do and become institutions where innovation is understood and embraced and where learning is even better connected to their community and the knowledge society.

Outcomes in science and mathematics, by international comparison, are encouraging and we are building on a relatively strong base. Australia is among the highest performers in reading, mathematical and scientific literacy as shown by results for 15-year-olds in the OECD Programme for International Student Assessment (PISA). Australia's results in the Third International Mathematics and Science Study (TIMSS) that assessed three cohorts—middle primary (9 year olds), junior secondary (13 year olds) and final year students—are also encouraging. At all three levels of schooling, and in both mathematics and science, Australian students performed above the international average and often at levels not far below the world leaders.¹⁸

We can generally take satisfaction from these performances while at the same time recognising that they do not necessarily reflect strong achievement by all students, or a profound interest in, or capacity for, innovativeness in learning and teaching. In any action taken to develop a capacity for innovativeness and to secure high-level outcomes for all students, attention needs to be given to the particular needs of Indigenous students and those from lower socio-economic backgrounds.

There is no question that a highly positive and productive learning climate exists in many of Australia's schools but it needs to exist in *all* Australia's schools. Such a climate provides a very substantial platform on which to build a culture of innovation in all schools. What is important is that:

- schools take explicit action to prepare *all* students for a society dependent on utilising knowledge for its prosperity;
- broad principles are developed to guide schools and school systems; and
- schools' capabilities are strengthened and supported, and resources are applied to achieve these ends.

The immediate implications of this are that schools need to develop new capabilities that are both strategic and organisational.¹⁹ In developing strategic capabilities, schools might be expected to:

- take a long-term view of their core business;
- develop their ability to identify and anticipate broad trends in society; and
- develop a capacity to look outwards and respond to the community and to change.

In building on their current organisational capabilities, schools might be expected to:

- adopt a whole-school approach that builds on good practice and embraces new ways of doing things; and
- develop greater internal and external cooperation with colleagues, other professionals, higher education institutions, parents, students, business, industry and the wider community.

Innovativeness and creativity are goals and conditions for learning and teaching. They call for a wide repertoire of teaching and management skills, methods and resources.

It is unrealistic to expect teachers on their own to deliver all that students require from their schooling.

Strengthening new partnerships with parents, business and industry, other schools, community groups and other educational institutions are all part of the necessary process of schools engaging with the wider world. Teachers are increasingly becoming knowledge workers and education managers. In determining the educational programs for their students, they are also managers for learning opportunities outside the parameters of what we currently see as a school. Clearly education authorities have an important role to play in helping schools look at ways to make their environment more disposed to developing a culture of innovation.

Integrating school-based learning with community and workplace learning provides opportunities for teachers to re-emphasise and re-invigorate their key professional capacities.²⁰ We need to know more about the effects of this engagement and the ways it can enhance and ensure positive learning outcomes for students. We also need to know more about why and how some of these outreach activities, and innovative curricula and pedagogies, sometimes run into difficulty.

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The challenge is for teachers to be more reflective and more analytical about teaching and learning itself and to be better equipped to teach students from a range of socio-cultural backgrounds including Indigenous Australians. Teachers themselves need support and guidance in handling innovative practices. A special responsibility falls on principals and other school leaders in developing an appropriate school climate that is reflective, self-evaluative and supportive. It is essential that those responsible for the governance of schools create an environment that enables and encourages principals and other school leaders to develop and nurture such a climate.

Key questions

- 3.1 What school organisational structures and partnerships would best support the development of an innovative capacity in students?**
- 3.2 What school governance arrangements would enable and encourage schools to develop a culture of innovation and an innovative capacity in students?**
- 3.3 At your school and in your community, what are the immediate, medium and longer term priorities for developing an innovative capacity in students and a culture of innovation?**
- 3.4 What examples are there of success—and of difficulties—in the development of a culture of innovation in schools and an innovative capacity in students?**

Teacher preparation, professional learning and development in a culture of innovation

The new economy presages a complex mix of teachers and paraprofessionals, a dramatically increased use of sophisticated learning technologies, and the blurring of institutional boundaries, as schools potentially become centres of community with strong external links. These developments may lead to a sea-change in the role of educators, and how this change is managed will impact greatly on teaching and learning outcomes. In particular, the prospect of dramatic change underlines the importance of professional development initiatives which are both ongoing and innovative in nature.²¹

Teachers remain pivotal to the learning outcomes that students need and Australia's teacher education programs are pivotal to preparing new entrants to the teaching profession. An innovation agenda asks both to re-consider their core functions, notions of professionalism and future directions. Similar issues to those faced by teachers and schools in developing innovative capacity in students also arise for universities. Education faculties have a central role in preparing teachers. To equip teachers with the necessary skills, knowledge and attitudes to enable them to develop an innovative capacity in students, and to contribute to a culture of innovation in Australia's schools, universities need to value and encourage innovation.

Developing a shared view about how innovation and innovative capacity building should be considered and emphasised in teacher education programs is part of this process. This would involve evaluating current teacher preparation programs to see how well they support these objectives and examining new knowledge and skills required of teachers, including the ways in which future teachers are expected to practice as individuals, members of teams and in whole school environments.

Greater collaboration across knowledge domains within and from outside the traditional academic environment may become more critical to preparing future teachers who themselves are expected to deal with the complexity and interconnectedness of knowledge. Key stakeholders, teacher employers, the teaching profession, and business, industry and the wider community as well as other faculties within universities need to engage with education faculties around the issue of innovation.

Teachers and schools need to be supported in their efforts to create learning environments and workplaces where innovation is valued and demonstrated. This will require professional learning and development opportunities that encourage teachers, leaders and school communities to consider the dimensions of innovation as it relates to students' learning outcomes, as well as its impact on schooling, including its relationships to broader societal trends. As the pace of change and the complexity of knowledge increase, there is a growing need for swift responses by teacher employers, higher education institutions and other training providers to ensure teachers have timely access to new knowledge and changing technologies.

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The interaction between practising teachers and students will have the greatest impact on developing an innovative capacity in students. Evaluation and repositioning of professional development and learning to enable and inculcate a culture of innovation is, therefore, fundamentally important for Australia's existing teaching workforce. There is a need to continue to invest heavily in a wide array of professional development and learning programs for teachers and to examine the most effective ways of ensuring that teachers' knowledge, skills and understandings are current.

Consistent with the broad objectives of an innovative learning capacity in students and a culture of innovation in schools, it is desirable to avoid a more limited view of professional development such as the specific set of activities that provide teachers with in-service training once they have entered the profession²². Any professional learning and development effort to progress an innovation agenda must be established on principles that are shown to impact most directly on student learning and critically influence teachers' expertise and quality of teaching. Ideally this would be systematic, structured, sustained and recognised²³ so that other related professional goals such as building professional collaboration, professional standards and expanding career structures²⁴ are also pursued. Planning and implementation should be informed by productive engagement with a more diverse range of stakeholders: teacher educators, teacher employers, the teaching profession, business, industry and the wider community.

New models of professional development and learning that would support an innovative culture in schools and their partnerships with the broader community could be examined. These may include teacher-leader positions that help schools work together to develop an innovative culture, provision of larger blocks of time for formal professional learning and development and teacher sabbaticals. They may take the form of addressing the needs of particular groups such as Indigenous Australians and students from rural and remote regions.

There may be new opportunities for faculties of education, science, the arts and humanities, and those faculties and departments responsible for teaching and research in other areas to provide professional learning and development for existing teachers and related professionals. In order to build an innovative capacity in students and a culture of innovation in schools, it is important for the education profession as a whole to have access to broader professional thinking across a more diverse range of fields including cultural, business, industry and management. The expertise and networks of higher education institutions are ideally placed to provide programs that develop and keep teachers and related practitioners at the forefront of new knowledge and skills.

Key questions

- 4.1 What skills, knowledge and support do teachers need so that they can develop an innovative learning capacity among their students?**
- 4.2 What are the implications for teacher education and for renewing cultures of innovation in schools?**
- 4.3 How do teacher education programs support and develop their students' appreciation and capacity for learning, creativity and innovation? In what ways do they do this and what are the successes?**
- 4.4 What is currently being done in on-going professional learning and development to support teachers to update knowledge and skills to maximise their impact on developing an innovative capacity in students?**
- 4.5 What on-going role could higher education institutions and others play in supporting and promoting professional learning and development in the teaching profession?**

Leadership at all levels

Introducing and embedding a culture of innovation in schools does not and will not happen unless schools, teachers and the education sector more broadly recognise the benefits that will flow. There is need, also, for a clear understanding that there may be difficulties to surmount. Effective policies and strategies are essential to organise schooling, including identifying resources and modifying, where necessary, school organisational structures such as curriculum and timetabling. New groupings of staff and new roles and relationships may be required. Leadership is the key to combining these ingredients to deliver innovation in schools.

Leadership takes many forms. Australian governments can play their parts in several ways:

- introducing appropriate changes to the frameworks within which schools operate;
- building a coalition of support for change with those groups which are key influencers on schools, teachers and education faculties:
 - schools, education authorities, professional associations and teacher unions
 - parent peak bodies
 - vice-chancellors and other senior members of universities
 - business and industry;
- providing the necessary resources for partnerships to support innovation; and
- supporting educational research and development and encouraging a cycle of continuous improvement at the school level.

Stakeholders, such as parents, teacher professional associations, teacher unions and higher education institutions, will need to provide leadership within their own organisations and constituencies to gain their continued support for a process to help schools become places where a culture of innovation thrives. To do this they have to be convinced of the benefits for students and teachers and they will need to help build that understanding within the profession in a consistent and more holistic way.

Business and industry also have a significant leadership role. All stakeholders need to acknowledge publicly and consistently two things that at times have been seen, erroneously, as contradictory but are in fact complementary:

- teachers and schools generally prepare students well for further education and the labour market; and
- significant changes, over time, are essential if students are to continue to be prepared for the labour market.

Developing a culture of innovation must be driven from the local or school level at the heart of learning if it is to be sustained. However, those responsible for school governance also have an important role in enabling schools to develop this culture.

Leadership in an educational institution needs to combine consensual decision-making, clarity of roles and relationships, and a constant emphasis on the concept of an inclusive learning community. Leaders also have a central role in expecting high standards to be achieved consistently and principal-leaders and teacher-leaders are equally important in successful school reform.²⁵ This suggests that the traditional association of leadership with positional authority needs to be reconsidered. Contemporary views of leadership place teachers in key roles in addressing the challenges of how to create the best learning environments and strategies for their students. “When teachers see themselves as leaders, they discover the potential to influence student learning through their own actions.”²⁶ Nor should student leadership be overlooked—both as a form of learning and as a mark of a student’s role in the life of the school community. Students clearly learn about and experience leadership through their own leadership roles and in the messages they take from the ways adults perform their roles in schools and in the wider community.

Key questions

- 5.1 What are the roles of the principal-leader and teacher-leader in supporting an innovative capacity in students and a culture of innovation in schools?**
- 5.2 What do parent groups, professional associations, teacher unions, higher education institutions, business, industry and the wider community need to be convinced of in order to sign up to supporting schools develop a culture of innovation?**
- 5.3 How should leaders within school communities be supported?**
- 5.4 What models are already operating successfully?**
- 5.5 How are students learning about leadership, responsibility and decision-making?**

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Attachment A

Review Committee

Professor Kwong Lee Dow AM—Chair
Deputy Vice Chancellor (Students & Staff)
The University of Melbourne

Ms Elizabeth O’Leary

Executive Director
Catch 22 Asia Pacific

Dr Peter Tannock

Vice Chancellor
University of Notre Dame

Ms Helen Paphitis

Principal
Salisbury High School

Mr Ken Rowe

Retired Principal
Frankston High School

Professor Anne Edwards

Vice Chancellor
Flinders University

Dr Ian Paterson AM

Retired Headmaster
Knox Grammar School

Professor Janet Greeley

Executive Dean
James Cook University

Mrs Jill Healey

Principal
Flinders Christian Community College

Professor Steve Dinham

Chair of Teacher Education, Pedagogy
and Professional Development
University of New England

Mr Phillip Kiely

Director, O² Asia Pacific Pty Ltd & Chair,
Enterprise & Career Education Foundation

Mrs Marianne Nicholas

Science Teacher, Walkerville Primary School and
Recipient, Prime Minister’s 2002 Prize for Excellence in
Science Teaching in Primary Schools

Attachment B

Reference Group

Ambassador, National Indigenous English Literacy & Numeracy Strategy	Ms Naomi Anstess
Australian Association of Mathematics Teachers Inc.	Mr Steve Thornton
Australian Chamber of Commerce & Industry	Mr Joe Moore
Australian College of Educators	Mr Jim Cumming
Australian Council for Computers in Education	Ms Cathy Crook
Australian Council for Education Through Technology	Mr Brian Webberley
Australian Council of Deans of Education	Professor Terence Lovat
Australian Council of Deans of Science	Professor William McGillivray
Australian Council of State Schools Organisations Inc.	Ms Julian Golby
Australian Curriculum Studies Association	Professor Alan Reid
Australian Education Union	Mr Denis Fitzgerald
Australian Parents Council Inc.	Ms Josephine Lonergan
Australian Principals' Associations' Professional Development Council	Mr Don Zoellner
Australian Science Teachers Association	Mr Peter Russo
Australian Society for Educational Technology	Mr Ian Thomas
Business Council of Australia	Ms Maria Tarrant
Federation of Australian Scientific and Technological Societies	Ms Jan Thomas
Independent Education Union of Australia	Mr Patrick Lee
IT Skills Hub	Ms Deirdre Mason
Mathematics Education Research Group of Australia Inc.	Ms Judy Mousley
MCEETYA Teacher Quality & Educational Leadership Taskforce	Mr Paul Leitch
MCEETYA Teacher Quality & Educational Leadership Taskforce	Dr John Roulston
National Catholic Education Commission	Dr Michael Gaffney
National Council of Independent Schools' Associations	Ms Audrey Jackson
Technology Education Federation of Australia	Mr Ralph Leonard

Attachment C

Terms of Reference

Review of Teaching and Teacher Education

The Prime Minister in launching the Government's Innovation Statement Backing Australia's Ability in January 2001 announced a range of measures to pursue excellence in research, science and technology and to build an even more highly skilled workforce. In this statement the Prime Minister announced a number of initiatives for immediate implementation and a number of strategies for longer-term implementation. One of the major long-term strategies announced was to:

... ensure that talented people are attracted to teaching as a career, especially in the fields of science and technology education, teaching and teacher education will be reviewed, in consultation with State and Territory Governments.²⁷

To implement this strategy, a Review Committee will be established to conduct a review of teaching and teacher education. Particular emphasis will be placed on the fields of science, technology and mathematics. The review will focus on teacher work force needs in these areas in the short term and skills teachers need to build a culture of continuous innovation in Australia's Schools in the longer term (2012).

The review will:

1. Build upon comprehensive work that analysed teacher supply and demand undertaken by the then Commonwealth Department of Education Training and Youth Affairs (DETYA) under the auspices of MCEETYA;
2. Draw upon recent literature and initiatives to describe the teaching skills needed to develop a culture of lifelong learning and innovation in Australia's school students;
3. Explore the impact of innovative pre-service and in-service education programmes on the development of teachers' pedagogic practices to enhance their students' appreciation and capacity for learning, creativity and innovation, with particular emphasis on the fields of science, technology and mathematics;
4. Map current skills and propose strategies for equipping teachers with the knowledge and skills to create an innovative learning culture amongst their students;
5. Examine leadership practices that attract and retain teachers, especially in the areas of science, technology and mathematics;
6. Produce an interim report, by end 2002, on strategies to attract and retain science, technology and mathematics teachers in Australia's schools; and
7. Produce an innovation action plan for the school sector, by mid 2003. This action plan will encapsulate a shared understanding of the school exit outcomes necessary to equip school graduates for the knowledge economy and society. The action plan will consider the current situation and future scenarios.

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