

EDUCATION IN A KNOWLEDGE ECONOMY

David Lynch

ABSTRACT

This paper reports aspects of a study that addresses shifting priorities in education and training that are consequences of historical change. It deals broadly with teacher renewal, in an environment where there is sufficient policy research, experience in dealing with school-based 'problems' and speculative writing to underscore a need for a change in what is traditionally detailed as the role and function of education, schooling and teaching.

The paper contrasts teaching and schooling as it currently exists in an emerging 'Knowledge Economy' where new electronic communication media have emerged; there is a rapid, and increasing pace of technological innovation and shorter technology and product life cycles and new economic communities, whose prime function is the distribution and exchange of goods across national and continental borders.

Given these conditions, the prognosis is that a 'worker' in the 'Knowledge Economy' will have characteristics including: an ability to adapt to constant change and uncertainty; capacity to work in knowledge and service based economies; and participate as constructive members in cohesive social communities. Accordingly, the paper proposes that such social changes and the emergence of the Knowledge Economy will entail a different education and schooling system to that which presently exists. The main premise of this proposition is that current schooling and teaching reflects the features of an industrial society and if society has changed, so then should the education and schooling system. In turn the associated teacher education system is also affected.

More specifically, the paper reports the impact that an emerging Knowledge Economy is having on schooling and teaching and by association, that of teacher education.

Education in a Knowledge Economy

This article reports aspects of a study which addresses shifting priorities in education and training that are consequences of historical change. The article contrasts teaching and schooling as it currently

exists in an emerging 'Knowledge Economy' where new electronic communication media have emerged (Rowland, 1999); there is a rapid, and still increasing pace of technological innovation and shorter technology and product life cycles (Freeman and Soete, 1997); new economic communities, whose prime function is the distribution and exchange of goods across national and continental borders, have been formed; where the market is increasingly technical and the consumers more informed (Freeman and Soete, 1997; Robertson, 1993, Ferguson, 1990).

Given these conditions, it is argued a 'worker' in the 'Knowledge Economy' will require characteristics including: an ability to adapt to constant change and uncertainty; capacity to work in knowledge and service based economies; and participate as a constructive member in cohesive social communities (Edgar, 1999; Education Queensland 2000). Accordingly, the article suggests such social changes and the emergence of the Knowledge Economy will entail a different education and schooling system to that which presently exists. The main premise of this proposition is that current schooling and teaching reflects the features of an industrial society and if society has changed, so then should the education and schooling system (Bentley, 1998). In turn the associated teacher education system is also affected.

The discussion begins with the defining of the term 'Knowledge Economy,' continuing with an exploration of its characteristics and impact upon society. In concluding sections, conventional teaching and schooling are compared and contrasted with the profile of a Knowledge Economy, for shifts of emphasis. I turn first to a definition for the term Knowledge Economy.

The term 'Knowledge Economy' was coined by the Organisation for Economic Cooperation and Development (OECD) in their report *The Knowledge-based Economy* (OECD, 1996). The term describes the emergence of economies based on the production, distribution and use of knowledge and information. By comparison, the economy of the early to mid twentieth century relied predominantly on the sale of raw resources, commodities and primary processing to generate income and wealth. The key commodity in the now emerging Knowledge Economy, by contrast, is 'knowledge' and its use to create new products

and services (Donkin, 1998; Gibbons, Limoges, Notwotny, Schwartzman, Scott and Trow, 1994).

More specifically, in the Knowledge-based Economy: -

“great importance is placed on the diffusion and use of information and knowledge as well as its creation. The determinants of success of enterprises, and of national economies as a whole are reliant upon their effectiveness in gathering and utilising knowledge. Strategic ‘know-how’ and competence are being developed interactively and shared within sub-groups and networks, where ‘know-who’ is significant. The economy becomes a hierarchy of networks driven by acceleration in the rate of change and the rate of learning. What is created is a networked society, where the opportunity and capability to access and join knowledge and learning intensive relations determines the socio-economic position of individuals and firms” (OECD, 1996, p. 14).

Characteristic of the Knowledge Economy are ‘man-made brain power industries’ where there is rapid development, and the subsequent merging of new information and communication technologies, creating a global inter-connected economy (Thurow, 2000, p: 1). In this global economy, time and distance are compressed through advances in information communication technologies and travel, leading to the intertwining of the world’s economic and cultural systems, in a process known as Globalisation (Nowotny, Scott and Gibbons, 2001). Globalisation is defined as “a set of economic, social, technological, political as well as cultural structures and processes arising from the changing character of the production, consumption and trade of goods and assets that comprise the base of the international political economy” (Milani and Dehalvi, 1996, p:3). Globalisation is one of many phenomena within the Knowledge Economy, and is the result of a larger building process of world markets that started when mankind first began exploring the world by land and sea expeditions (Thurow, 2000; Milani and Dehalvi, 1996).

The principal driving force in the globalisation process today is the search by both private and public firms for worldwide profit: their efforts are made possible by advances in information communication technologies and by decreasing transport and communication costs. These advancements and efficiencies are allowing business to be

conducted at any time of the day and contact to be made with all countries by 'jet age' travel or by using a range of information communication technologies (Thurow, 2000).

An effect of globalisation is an increasing structural differentiation of such goods and assets, having spread across traditional political borders and economic sectors, resulting in a greater influence on political and economic changes. Consequently governments of today are dispensing with their 'regulator role' or the function of controlling their national economies "to become 'platform builders' that invest in infrastructure, education and research and development, so as to allow their citizens to have the opportunity to earn world class standards of living" (Thurow, 2000, p:1). The 'Smart State' strategy in Queensland is one such example of governments coming to terms with the Knowledge Economy and the resultant effects of globalisation (Beattie, 1999).

The technologies that characterise the Knowledge Economy (such as micro-electronics, computers, robotics, telecommunications, new material developments, biotechnology, forms of travel and transport) are systematically changing how all people conduct their economic and social lives (Thurow, 2000). Products (such as electrical equipment, furniture and other household products), that were once assembled using armies of skilled and semi-skilled manual workers, are now produced in factories with computers and robotic technologies. These new factory configurations require small numbers of highly skilled maintenance people, so that a product's on-costs are lower than with human labour; albeit with no industrial disputes and therefore with no additional overheads. Given the relatively low prices of such products and the rate at which new and better products enter the market, the need for a 'repair and maintenance' industry is superseded by a rationality which says 'throw-away' and upgrade (Ilon, 2000).

In contrast to the previous industrial economy, working in the 'new economy' puts a premium on familiarity with networked knowledge rather than with scarcity. In the Knowledge Economy, the more networks individuals have, the higher the value of relationships. People steeped in the industrial-era model tend not to comprehend

this new mode of operating (Barlow in Tunbridge, 1995), and to survive in their industry use 'union muscle' to maintain the status quo and thereby protect their employment. This mindset ultimately shortens their employment tenure as 'employers' turn to technology-based innovations for solutions (Ilon, 2000).

In short, the industrial-era mind-set affirms the emergent world as 'the same' as it always was, but with more 'problems' to grapple with. People with this mindset often seek to package and deliver the 'old' more 'effectively' and are wary of the 'change' that threatens what they know. The contrasting mind-set asserts that the world, because of the effects of new technologies, the structure of a new kind of labour market, the universalism of popular culture, the need for self-assertion and patently different life prospects for young people, is radically different, and the approaches therefore must also be radically different (Bentley, 1998; Davis and Botkin, 1995)

The structure and character of families in the Knowledge Economy has changed from the nuclear family of the 'home' and the nurturing family assumed in much curriculum development in schools. There are new patterns of employment and underemployment, greater mobility and new concentrations of poverty in both rural and urban settings and a redefining of what constitutes work and employment; collectively creating uncertainty for families and family-life (Nowotny, Scott and Gibbons, 2001; Edgar, 1999; Ilon, 2000). Recent developments in the health and medical fields allow people to 'cheat their biology' (invitro-fertilisation and various contraceptive regimes, for example, allow women to put off child-birth until later years, whilst new and better drugs allow people to live longer) collectively redefining the role and function of men, women, work and family-life in the rapidly emerging knowledge society (Edgar, 1999).

The characteristics of the average worker in western economies, for example, and the nature of work itself have changed enormously over the past few decades. Part-time, temporary and casual work, coupled with an upward trend in unemployment and the widening earning dispersion has become 'the norm' in the 'job market,' while privatisation, deregulation and downsizing of public services, and more

and more pressure on business to increase productivity has been characteristic of the workplace (Doyle, Kurth and Kerr, 2000, pp1-2).

At the conclusion of the twentieth century more jobs were in 'service related activities' than ever before (ANTA, 1999), and characteristically since the 1980's in Australia there has been a rise in employment in an 'office sector' (doing work associated with: finance, administration, supervision, law, advertising, sales management, marketing and business related services) where the outputs of such jobs are not physical products or services. These 'new jobs' trade information, money, advice and resources, more often than physical skills or labour. "These people are not employed in goods production or over-the-counter retail or hospitality. Their mission is to trade knowledge: they are effectively knowledge workers in a Knowledge Economy" (Doyle, Kurth and Kerr, 2000, pp1-2).

For most of the Twentieth Century, industrial societies [for which schools and teaching were founded (Bidwell, 2001; Logan and Watson, 1992)] have increased their economic productivity through the manufacturing process of 'mass production'. During the initial phases of mass production workers maintained some individual control over the ways they did their work. Employment was constructed around tradesmen (skilled employees) and their assistants (semi-skilled and unskilled employees), and as such, they continued to do those tasks which could not be automated. Such tasks were largely undertaken according to their own whims and insights, backed up by a strongly developed and well-planned unionised framework, guaranteeing working conditions and remunerations (Hancock, 2002; Industrial Relations and Management, 2000).

By comparison mass production today has evolved to a point where factories exist with few or no employees, with most, if not all of the 'tradesmen' type functions being replaced by computerised robots with a ready supply of 'plug-in-and-play' components for parts which fail: creating little need for a trade-type workforce (Setzler and Bentley, 1999). The people who constitute the key workforce of factories today are designers and innovators who create 'new knowledges' and use such to create new products and services (Clarke, 2001).

The building industry, as an example, is cited as a growth industry, yet most construction elements are now prefabricated in automated computerised factories devoid of many 'tradesman-type' skills, requiring only a handful of skilled people in the field to assemble (Pheng, 2002; Warszawski, 1994). The consequences of this production profile are significant increases in building-sector productivity as fewer people are able to build more buildings, more often, with fewer labour-based overheads, so that profit margins for corporations increase (Pheng, 2002). This occurrence is now characteristic of the job market in the Knowledge Economy.

Commentators, such as; Ilon (2000), Thurow (2000), Starr (2001), argue "technological advancement will certainly destroy many jobs, however at the same time it will create many new and as yet unknown employment opportunities, changing dramatically the balance of skill requirements" (OECD, 1996, p. 14). The skill elements referred to are ones that place great importance on the diffusion and use of information and knowledge as well as its creation. This skill-base allows incumbents to gather and utilise knowledge, where strategic 'know-how' and competence are developed interactively and shared within sub-groups and networks. In this organisational climate, continual innovation and learning, driven by a hierarchy of networks, becomes characteristic of 'work' that is undertaken in a Knowledge Economy. (OECD, 1996).

Given the change in skills required of 'workers' in the Knowledge Economy, many large companies are spending large sums of money on workforce education and training. The driving force behind such decisions are a combination of a 'thin supply' of skilled workers and an increasingly complex workplace, where intellectual capital has emerged as a key source of competitive advantage for business in the 2000 epoch (Starr, 2001, p:1).

Security of employment, once synonymous with industrial age occupations, is now making way for increasing levels of casual and contract tenure, where little scope exists for the unskilled employee. So key to working in the Knowledge Economy is an ability to embed oneself in life-long and continuous education and training (Healey and Shimeld, 2002). Consequently, 'life-long learning' and 'workplace

ready' have become two of the most frequently used terms in education and training circles during the 1990s (Curtis and McKenzie, 2001, p:2) with policy documents at national, state and institutional levels within Australia, for example, increasingly being framed from a life-long and workplace-ready perspective. For educational institutions this means expanding their educational offerings by providing non-traditional learning programs, and incorporating various communication technologies (such as 'on-line' and 'e-learning packages') so as to cater for the 'flexible time and space concepts' that characterise 'learners and earners' in the 2000 epoch (Nowotony, Scott and Gibbons, 2002; Edgar, 1999; Landen, 1997).

At an international level, life-long learning has been adopted as the key organising concept in education and training programs (see OECD, 1996; Delors, 1996). In Australia there have been numerous reports (for examples see: West, 1998; ANTA, 1998; Ministerial Council on Education, Employment, Training and Youth Affairs, 1999; Business Council of Australia, 2000), each arguing the need to "strengthen links between education and industry and for schools to embrace curriculum and education processes which foster and encourage continual learning over the life span" (Curtis and McKenzie, 2001).

Given the significant investment in education and training being made by business and industry, particularly in the light of a profit conscious shareholding, the role played by education, training, teaching and schooling, in supporting corporate activity in the Knowledge Economy, is under scrutiny. Commentators, such as Bentley (1998) and Hargreaves (1997), argue education systems (as institutions that prepare young people in appropriate ways for the challenges and responsibilities of life and society) represent significant investments of public monies, "and if society is changing so should the way in which *they* introduce young people to it" (Bentley, 1998, p38).

There are two dominant views of education and the role it should play, in a Knowledge Economy. One set of literature contends that a Knowledge Economy driven by technology has the potential to reverse trends in differential access to educational resources and/or confers on students an increased set of skills and opportunities. In this view, educators need only to ride the wave and recognise the increased

opportunities when they appear (Binde, 1998; Groennings, 1997). The second view is that an increased linkage between education and the economy is an element of global capitalist hegemony that weakens non-market values of humanitarianism, equity and ecology. In this view, education ought to generate resistance to 'marketisation' (De Vaney, 1998; Chafy, 1997; Moran & Selfe, 1999). Nevertheless, both views assume that the most important role for educators to play is to respond to a Knowledge Economy (Ilon, 2000, p: 1).

Australia has moved more rapidly over the past decade than have most OECD countries towards a market-orientated demand-led education and training system, with published reports and policy documents promoting a strengthening of linkages between education and the labour markets. One of the key policy documents used is the *National Goals for Schooling in the Twenty-First Century* (MCEETYA, 1999). The policy recognises Australia's economic and social circumstances in the emerging Knowledge Economy, seeking to "ensure the employability of those who pass through Australia's school system" (Curtis and McKenzie, 2001, p:18). The policy specifically promulgates the embedding of key employability skills in school curricula and in student assessment (Curtis and McKenzie, 2001, p:10). Fundamentally these employability skills mean young people who leave school will have a series of employment related knowledge, skills and understandings, each of which is able to be translated into productive work for employing organisations (Ghost, 2002).

For many teachers vocational and 'workplace-ready' education is seen as a role for colleges of technical and further education (TAFE), universities or certain secondary school curriculum programs, such as work experience and not the domain of the mainstream schools and teachers. But debates from industry perspectives are demanding attentions be focussed to the purposes of education and the wide benefits that learning plays in the Knowledge Economy. To date this agenda has provided greater understandings of life-long learning (Ryan, 2002, p:29) and in Queensland for example, has spawned a new strategic plan (*'Queensland State Education, 2010'*) with curriculum reform a key operational strategy (Education Queensland, 2000; Edgar, 1999).

Curriculum reform issues throughout the 1990's, particularly in secondary schools, have tended to centre on two opposed sets of norms. In many countries, the secondary school curriculum has traditionally been controlled by universities and secondary examination bodies. Consequently, the secondary school curriculum has catered to the needs of the more academically able, many of whom aim for university entrance (Dimmock, 1999). With an increasing trend for students to remain longer at schools, primarily because the job market demands higher knowledge and skill levels, large numbers of high school students have become disenfranchised to learning (Buckingham, 2000) as traditional curriculum offerings hold little relevance to their job-seeking needs (Beattie, 1999; Dimmock, 1999) and their diverse learning styles (OECD, 2002; Abbott and Ryan, 1998; Bentley; 1998) . "School leaders are faced with intractable decisions between pressures to maintain traditional curriculum norms and to introduce a broad-based, diversified curriculum catering for all needs. Both sets of norms carry implications for institutional structures, processes and resources" (Dimmock, 1999, p 445).

Conventional schooling, in a pedagogic sense, is a 'teacher centred' activity, where systemically developed syllabi and associated curriculum guidelines provide teachers with defined content to 'be covered' during a given school year, through a series of 'age related' groupings. In this organisational model, students that demonstrate capacity with an ever increasing level of 'education' continue on to further study, while others will 'drop-out' and begin work (Presnsky, 2002; Wise, 2002). In recent times, in Queensland for example, laws have been made to ensure all students complete higher levels of education (Education Queensland, 2002). These laws are intended to have the effect of forcing a 'rethink' on current school curriculum. Consequently vocation education and training is being highlighted as a key schooling domain (Healey and Shimeld, 2002):

According to Hartwell (1996) schooling is "the most conservative of social institutions ...taking.... about 100 years for scientific theories and ideas to affect the content, processes, and structure of schooling." He details the pace of change in modern society as accelerating and concludes:

"the 20th century has produced a radical shift in scientific concepts of nature, reality, and epistemology: relativity theory, quantum mechanics, the discovery of DNA and, since mid-century, the development of theories of chaos and complexity. While the popular concept of reality in the 20th century has been mechanical, the metaphor for the 21st century is likely to be organic. Public schools have not yet reflected this shift" (Hartwell, 1996).

Dimmock (2000) makes comment that:

"In many instances, perhaps even the majority, the grounds on which teachers adopt particular teaching methods are manifold, but rarely do they include knowledge based on informed practice. Rather, teaching methods are based on teachers' past teaching and learning experiences, as well as on personal traits and preferences. Some of these reflect the way they were taught at school. Others reflect their own learning style preferences. Over the passage of time, however, it appears that teachers come to rely on a narrower, rather than broader, range of methods and especially on those from which they derive confidence and comfort and which offer them economy and efficiency of effort in coping with the daily pressures of lesson delivery" (Dimmock, 2000).

A fundamental part of the curriculum reform debate centres on improving the quality of teaching and learning where the teacher-centred, traditional method of teaching (with over-reliance on a narrow range of mainly didactic strategies) changes to a student-centred, 'teaching-for-learning emphasis,' embracing a wider range of teaching strategies. A major component is the recognition that there is a need to accommodate individualised learning programs into institutional structures. Numerous educational researchers (for example, OECD, 2002; Dembo & Eaton, 2000; Topper, 2000; Scherer, 1999; Walters, 1992) have argued for the adoption of more innovative and student-inclusive learning models to break the hegemony of the 'one-size-fits-all' syndrome of public school education, training and university education systems. There are two important elements in this trend.

The first element is the movement from disciplinarity to a more heterogenous knowledge production identified by Gibbons et al and Notwotny et al. In its simplest form, the relevant contrast is between problem-solving, based on the cognitive and social norms and practices of a particular discipline and those that are organised around a

particular 'application.' In the former, the discipline tends to determine the context and outcomes, whereas in the second element, knowledge is intended to be useful to someone whether in classrooms, the community, industry, government, or society more generally. Such knowledge is always produced in a process of continuous negotiation so that the interests of the various parties are included (Gibbons, 1994)

Further, recent advances in learning-based technologies (see for example Roschelle, Pea, Hoadley, Gordin, Means, 2000; OECD, 2002) provide understandings today that a 'one-size-fits-all system' fails to recognize the many different kinds of aptitudes, interests and experiences, and that therefore many students become bored and disinterested with the whole process. Conventional schooling practices endeavour to compensate for the loss of intrinsic interest in the work itself by providing extrinsic rewards (such as; marks, grades, prizes, scholarships), so keeping people going in things that don't interest them.

"Most of the time, what keeps students going in school is not intrinsic motivation - motivation derived from the process of learning itself - but extrinsic motivation - motivation that comes from the real or perceived consequences associated with success or failure...over the course of their educational careers, students are increasingly exposed to extrinsic rewards for schoolwork" (Steinberg, 1997).

The educational trends outlined in this article have been chronicled in many reports in Australia (Ramsey, 2000; Darling-Hammond; Kirby, 2000; Education Queensland, 2000; Gardner 1999; Foley, 1998), each arguing for a substantial overhaul of teaching and teacher education to keep pace with the interplay between social cohesion, citizenship, work and training that is occurring as a result of a Knowledge Economy.

These reports collectively argue that conventional schooling is based on 'teacher-centred activities' designed to fulfil the needs of a now passed industrial economy. In this model, students who demonstrate capacity with an ever-increasing level of 'education' continue on to further study, while others will 'drop-out' and begin work (Presnky, 2002; Wise, 2002). In a Knowledge Economy, the job-market is requiring higher skills of *all* workers and so those who 'drop-out' are relegated

to unemployment or short term low paid menial tasks with little or no scope for advancement. The only hope for these people is an education and training system attuned to the needs of all learners. Conventional teaching, by virtue of its design and scope does not 'measure up' (Hargreaves, 1997 and 1998)

Missing from the conventional schooling model is a strategy that builds capacity for work in a Knowledge Economy. This capacity is characterised by skill elements that place great importance on the diffusion and use of information and knowledge as well as its creation. This new capacity allows incumbents to gather and utilise knowledge and strategic 'know-how,' where competence is developed interactively and shared within sub-groups and networks, coupled with continual innovation and learning, driven by a hierarchy of networks.

Commentators (such as Lynch and Smith 2002; Abbot and Ryan 1998; Hargreaves, 1997), argue the current teaching workforce, as a pool of expertise and authority (i.e. intellectual capital) in the various education systems, has not universally had the disposition, knowledge and skill to re-engineer education systems for the new historical epoch in the 2000s period, as defined in previous discussions. Consequently teacher preparation also requires an overhaul (Ramsey, 2000; Education Queensland, 2000; Smith, 2000; Gardner, 1999; Foley, 1998).

The notion of overhauling teacher education is echoed in recent reviews of Australian teacher education, where it is argued a fresh approach to the preparation of teachers is needed, citing teachers as key participants in the renewal of education and training systems. Ramsey (2000) proposes that employers take a greater role in and responsibility for the outcomes of teacher education (Ramsay, 2000, pp. 58-59). Smith argues that "if teachers are to be change-agents, then reform of teacher education itself is as much a priority as school reform" as "there is a growing awareness that part of the problem is what student teachers learn and how they learn it" (2000,p:15).

The challenge for the education community collectively then, is to engineer an alternate education, schooling and teaching paradigm; one that is beyond the familiar and that which is considered traditional to growing up, to one that is aligned to a new world that is a 'Knowledge Economy'.

REFERENCE LIST

- Abbott, J. and Ryan, T. (1998), "Making the Case: Understanding the Disconnects that Explain Why Good Schools Will Never be Good Enough to Meet the Learning Needs of Children in the 21st Century", *House of Commons Parliamentary Monitor*, May.
- Anta, (1999), *A New Look at the Labour Market*, Australian National Training Authority, Brisbane, August.
- Barlow, J.(1995) cited in Tunbridge, N., (1995). "The Cyberspace Cowboy". *Australian Personal Computer*. September.
- Beattie, P. (1999), " A Brighter Future for Our Kids in the Smart State", *Luncheon on Education*, Brisbane Institute, Brisbane, December 14.
- Bentley, T. (1998), *Learning Beyond the Classroom: Educating for a Changing World*. London: Routledge, p. 53.
- Bidwell, C. (2001) , "Analyzing Schools as Organizations: Long-term Permanence and Short-term Change" *Sociology of Education*; Albany; 2001, pp. 100-114
- Binge, J. (1998) "Communication and Intelligence: Distance Education and Culture, Futures", 30(8), pp. 843-849. *Business Week* (1999) Class is where the computer is, 11 January, p. 133.
- Buckingham, J. (2000), "Lessons to be Learnt", *The Courier Mail*, August 2, p:13
- Business Council of Australia (2001), "The Innovations Summit", *Ideas for Australia's Future*, Melbourne: BCA.
- Chafy, R. (1997) "Science and Technology Education in China: Skills for Modernization in the Absence of Criticism", *Bulletin of Science, Technology and Society*, Vol. 17, No. 1, pp. 37-46.
- Clarke, T. (2001), "The Knowledge Economy", *Education and Training*, London, Issue 4/5, Vol. 43, p:189- 193.
- Curtis, D. and McKenzie, P. (2001), "Employability Skills for Australian Industry: Literature Review and Framework Development", *Report to Business Council of Australia, Australian Chamber of Commerce and Industry*, December 2001, Located at http://www.dest.gov.au/ty/publications/employability_skills/literature_research.pdf
- Darling-Hammond, L., Ancess, J., & Falk, B. (1995). *Authentic assessment in action: Studies of schools and students at work*. New York: Teachers College Press
- Davis, S. and Botkin, J. (1995) *The Monster Under the Bed : How Business Is Mastering the Opportunity of Knowledge for Profit*. New York: Touchstone.
- Delors,J. (1996), "Learning: The Treasure Within", *Report to UNESCO of the International Commission of Education of the 21st Century*, Paris, United Nations Educational, Scientific and Cultural Organisation.
- Dembo, M. H., & Eaton, M. J. (2000), "Self-regulation of Academic Learning in Middle-level Schools", *The Elementary School Journal*, May, Vol 100, No 50, pp. 473-490.
- De Vaney, A. (1998),"Can and need educational technology become a postmodern enterprise?", *Theory into Practice*, Vol. 37, No.1, pp. 72-80.

- Dimmock, C., (2000), *The Learning Focused School*, Falmer Press.
- Dimmock, C., (1999), "Principals and School Restructuring: Conceptualising Challenges as Dilemmas", *Journal of Educational Administration*; Armidale; Vol. 37, Issue p:441
- Doyle, L., Kurth, B., and Kerr, E. (2000), *Knowledge Work and the Rise of the Office Economy*, National Training Authority Report, Brisbane.
- Donkin, R. (1998), "Year of the Knowledge Worker", *Financial Times*, January 9.
- Edgar, D. (1999), "Learning to Live with Complexity: Social trends and their impact on Queensland Education", *Discussion Paper for 2010 Queensland State Education*, Education Queensland Printer, Brisbane
- Education Queensland (2000), *2010: Queensland State Education*, Education Queensland Printer, Brisbane.
- Foley, K. (1998), "The Initial Transition - From k-12 to Post-secondary Education: Bridging the Gap through Experiential Learning", *Challenge Paper prepared for the Council of Ministers of Education, Canada*.
- Ferguson, R., (1990), "Deregulation and Change", *Current Affairs Bulletin*, Vol. 67, No. 4, pp11-15.
- Rowland, W., (1999), *The Spirit of the Web: The Age of Information from Telegraph to Internet* (Key Porter).
- Freeman and Soete, (1997), *The Economics of Industrial Innovation*. Third edition (Pinter).
- Gardner, H. (1999), *The Disciplined Mind: What All Students Should Understand*, New York, Simon and Schuster, New York.
- Ghost, S. (2002), "VET in Schools: the Needs of Industry", *Unicorn (Journal of the Australian College of Educators)*, Vol. 28, No: 3, West Deakin, December, pp29-33.
- Gibbons, M., (1994), *Innovation and the Developing System of Knowledge Production*, University of Sussex, Falmer, Brighton, BN1 9RF, Located at <http://edie.cprost.sfu.ca/summer/papers/Michael.Gibbons.html>
- Gibbons, M., Limoges, C., Notwotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994) *The New Production of Knowledge*. London: Sage.
- Groennings, S. (1997) The Fulbright Program in the global knowledge economy: the nation's neglected comparative advantage, *Journal of Studies in International Education*, 1 (1), pp. 95-105.
- Hancock, K. (2000), "Trends in Australian Industrial Regulation", *Australian Bulletin of Labour*, Vol 26, No 2 June 2000 pp83- 96.
- Hargreaves, D. (1998), *The Argument in Creative Professional: The Role of Teachers in the Knowledge Society*, London, Demos, pp13-26.
- Hargreaves, D. (1997) *In Defence of Research for Evidence Based Teaching: A Rejoinder to Martyn Hammersley*, *British Education Research Journal*, 23, pp405-419.
- Hatwell, A., (1996), "Scientific Ideas and Education in the 21st Century", *21 Learning Century Learning Initiative*, located at www.21learn.org
- Healey, B. and Shimeld, J. (2002), "What Does Learning Mean in a Post-industrial Economy", *Unicorn (Journal of the Australian College of Educators)*, Vol. 28, No: 3 December, Deakin West.

- Ilon, L. (2000), "Knowledge ,Labour and Education", *Compare*, Oxford, October 2000.
- Industrial Relations and Management (2000), "The State of Our Major Unions", *Industrial relations & Management Letter*, vol 17 no 7 August 2000 pp2-5.
- Landen, M. (1997), "The Role of Technology in Education and Training", *Industry and Commercial Training*, Vol. 29, No: 7, MCB University Press, pp230-235.
- Logan, G. and Watson, T.,(1992), *Soldiers of Service* , AEBIS Publishing, Brisbane.
- Lynch, D., and Smith, R. ,(2002), "Australian Schooling: What Future?", *Unicorn On-Line Refereed Articles*, No:17, Australian College of Educators, located at <http://www.austcolled.com.au/resourcespage.html>,
- Milani, C. and Dehlavi, A. (1996), *Global Transformations and Coping Strategies: a research agenda for the MOST Program*, United Nations Educational, Social and Cultural organisation, Paris.
- Ministerial Council on Education, Employment, Training and Youth Affairs, (1999), *National Report on Schooling in Australia*, located at <http://www.curriculum.edu.au/mceetya/public/pub325.htm>
- Moran, C. & Selfe, C. L. (1999), "Teaching English Across the Technology / wealth Gap", *English Journal*, VOL. 88, No. 6, p. 48.
- Nowotny, H., Scott, P., Gibbons, M. (2002), *Rethinking Science: Knowledge and the Public in an Age of Uncertainty*. London: Polity.
- OECD (2002), *Understanding the Brain: Towards a New Learning Science*. Paris, OECD Publications
- OECD (1996), *The Knowledge-Based Economy*, OECD, Paris.
- Pheng, L.S., (2002), "Promoting innovation in prefabrication for public housing: Case study of Singapore", *International Journal for Housing Science and Its Applications*, International Association for Housing, Vol. 26, No. 3, pp 217-226
- Prensky, M. (2002), "Evolving instruction? Seven challenges On The Horizon", *The Strategic Planning Resource for Education Professionals*, Emerald, Vol. 10 No. 2 Page: p21
- Ramsey, G. (2000), 'Quality matters - Revitalising teaching: critical times, critical choices. Report of the Review of Teacher Education', NSW Department of Education and Training, Sydney.
- Robertson, S.,(1993) "The Politics of Devolution, Self management and Post-Fordism in Schools," in Symth J.,(1993), *A Socially Critical View of the Self Managing School* ,Falmer Press, London, pp117-136.
- Roschelle, J., Pea, R., Hoadley, C., Gordin, D. and Means, B. (2000), "Changing How and What Children Learn in a School with Computer-based Technologies", *The Future of Children*, Los Altos, Vol 10., Issue 2, pp76-110.
- Ryan, M. (2002), "Teaching and Vocational Learning", *Unicorn (Journal of the Australian College of Educators)*, Vol. 28, No: 3, West Deakin, December, pp29-33.

- Scherer, M. (1999), 'The Understanding Pathway: a conversation with Howard Gardner', *Educational Leadership*, Vol 57, No 3, pp. 13-17.
- Seltzer and Bentley (1999), *The Creative Age: knowledge and Skills for the New Economy*, London: Demos
- Smith, R. (2000), "The Future of Teacher Education: Principles and Prospects", *Asia-Pacific Journal of Teacher Education*, Vol. 28, Number 1.
- Starr, T. (2001), "Leading the Education Function into the Future", *Benefits Quarterly*, Brookfield, Fourth Quarter, 2001.
- Steinberg, L. (1997), *Beyond the Classroom*, New York: Simon and Schuster
- Topper, A. G. (2000), 'Teachers' beliefs about technology, teaching, learning, and their role in shaping plans for classroom technology use', GVSU School of Education, U.S.A. Available Toppera@GVSU.EDU
- Thurow, L. (2000), "Globalisation: the Product of a Knowledge-Based Economy", *Annals of the American Academy of Political and Social Science*, Thousand Oaks, July 2000.
- Walters, J. (1992), 'Application of Multiple Intelligences Research in Alternative Assessment', *Proceedings of the 2nd National Research Symposium on Limited English*.
- Warszawski, A. (1994), "Current Trends in the Operation of Building-Construction Companies", *International Journal of Project Management*, vol 12, no 4, Nov, Butterworth-Heinemann Ltd, Oxford, p 261-268
- West, R., (1998), "Learning For Life: Final Report", *Review of Higher Education Financing and Policy*; Canberra, Department of Education, Employment and Youth Affairs.
- Wise, D. (2002), "When the Art of Teaching Meets the Science of Learning", *Second International Online Conference*, Technology College Trust, PP.13-26 October and 24 November – 7 December, 2002, located at http://www.cybertext.net.au/tct2002/disc_papers/learning/printable/wise%20-%20printable.htm