Teaching for the knowledge society: educating for ingenuity

The paradoxical profession

Teaching is a paradoxical profession. Of all the jobs that are or aspire to be professions, only teaching is expected to create the human skills and capacities that will enable individuals and organizations to survive and succeed in today’s knowledge society. Teachers, more than anyone, are expected to build learning communities, create the knowledge society and develop the capacities for innovation, flexibility and commitment to change that are essential to economic prosperity. At the same time, teachers are also expected to mitigate and counteract many of the immense problems that knowledge societies create, such as excessive consumerism, loss of community and widening gaps between rich and poor. Somehow, teachers must try to achieve these seemingly contradictory goals simultaneously. This is their professional paradox.

Meanwhile, public expenditure, education and welfare have been the first casualties of the slimmed-down state that knowledge economies have often required. Teachers’ salaries and work conditions have been among the most expensive items at the top of the public service casualty list.

In the industrial revolution, resources of human labour moved from the country to the city. This mass migration filled the Dickensian factories and dark satanic mills of the period with labour power. But in the face of overcrowding and urban squalor, this movement also prompted the creation of great institutions of public space and public life such as state education, public libraries and the great municipal parks. The economic explosion of the industrial revolution was not limitless. It was counterbalanced by acts of civic and philanthropic responsibility that
provided learning, schooling and green urban space that would benefit the people.

The knowledge revolution has been redirecting resources once more: this time from the public purse to private pockets as a way to boost consumer spending and stimulate stock market investment in a global casino of endless speculation. There is little sign of social compensation or counterbalancing in this second revolution. Indeed, its drain on public spending and its championing of private choice is placing many of our public institutions, including state education, in jeopardy. Just when we are expecting the very most of teachers to prepare children for the knowledge society, their total salary costs that result from being a mass profession have driven many governments to limit or withhold the resources and support that teachers need in order to be more effective. In damaging the teachers of the next generations, the knowledge economy is eating its young.

The knowledge society finds it difficult to make teaching a true learning profession. It craves higher standards of learning and teaching, yet it has also subjected teachers to public attacks; eroded their autonomy of judgement and conditions of work; created epidemics of standardization and overregulation; and provoked tidal waves of resignation and early retirement, crises of recruitment, and shortages of eager and able educational leaders. The very profession which is so often said to be of such vital importance for the knowledge economy is the one that too many groups have devalued, more and more people want to leave, fewer and fewer want to join, and very few are interested in leading. This is more than a paradox. It is a crisis of disturbing proportions.

Teachers today therefore find themselves caught in a triangle of competing interests and imperatives (Figure 1.1):

*Figure 1.1  Teaching in the knowledge society*
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• to be *catalysts* of the knowledge society and all the opportunity and prosperity it promises to bring;
• to be *counterpoints* for the knowledge society and its threats to inclusiveness, security and public life;
• to be *casualties* of the knowledge society in a world where escalating expectations for education are being met with standardized solutions, provided at minimum cost.

These three forces, their interactions and effects, are shaping the nature of teaching, what it means to be a teacher, and the very viability of teaching as a profession in the knowledge society.

Before the knowledge society

Since the emergence of compulsory schooling and its spread across the world, state education has repeatedly been expected to save society. Schools and their teachers have been expected to rescue children from poverty and destitution; to rebuild nationhood in the aftermath of war; to develop universal literacy as a platform for economic survival; to create skilled workers even when little suitable employment has beckoned them; to develop tolerance among children in a world where adults are divided by religious and ethnic conflict; to cultivate democratic sentiments in societies that bear the scars of totalitarianism; to keep developed nations economically competitive and help developing ones become so; and to eliminate drugs, end violence and make restitution for the sins of the present generation by reshaping how educators prepare the generations of the future.

Expectations for state education have always been high, but they have not always been expressed in the same way. In the thirty years following World War II, education in the world’s leading economies was widely viewed as an investment in human capital, in scientific and technological development, in a commitment to progress.1 Booming demographics in what Eric Hobsbawm calls ‘the golden age of history’2 led to a call for more teachers, optimism about the power of education, and pride in being a professional as a young and expanding generational cohort of teachers developed the bargaining power to raise their salaries, became an increasingly well qualified and more graduate-based profession, and were accorded greater status and sometimes flexibility and discretion in how they performed their work. In this *age of the autonomous professional*, as I have called it, many teachers in developed, democratic countries benefited from expanding populations, prosperous economies and benign states.3

While all this optimism, expansion and autonomy increased people’s access to state education, it did little to change the fundamental nature of
the education provided or the way teachers taught. Few innovations lasted for long, and the rhetoric of classroom change usually outstripped the reality. Behind all the autonomy, attempted innovation and educational expansion, a basic ‘grammar’ of teaching and learning persisted where most teachers taught as they had for generations, from the front, through lecturing, seatwork and question-and-answer methods, with separate classes of age-alike children, evaluated by standard paper-and-pencil methods.

Less developed countries inherited different economic and cultural legacies, and had a disproportionately tiny share of the world’s wealth with which to address them. Aid was largely directed towards establishing and extending basic primary or elementary education and creating the fundamental literacy levels that were seen as essential for economic ‘lift-off’ and independence. But resources were limited, class sizes were (and mainly still are) overwhelming, technologies could be basic in the extreme, with stones for seats and sand for chalkboards, and teachers’ qualifications, expertise and salaries were poor. In secondary schools, smaller elites often learned the curricula of their colonial masters, they were taught it in didactic ways and they were separated from their experience and drawn away from their own people as a result. Teaching here remained confined to what I have called a pre-professional age, where poorly paid and prepared teachers were only able to master and use a restricted range of teaching strategies. These strategies – little more than strategies for coping with and surviving the situations they faced – might have suited the constraining circumstances and finances of less developed countries, but they also became ingrained in teachers’ and other people’s imaginations as the only possible ways to teach.

The oil crisis of 1973 and the collapse of Keynesian economics brought an end to optimistic educational assumptions in many of the developed economies of the West. Education suddenly became the problem, not the solution. In debt-burdened economies, welfare states began to collapse, and resources for education with them. Western nations turned inward and many lost their confidence as they became overshadowed by Asian ‘tiger’ economies. Meanwhile, demographics went into reverse, pupil populations shrank, teachers lost their market attraction and bargaining power, and the bulk of the remaining teaching force began to show its age.

In academic circles, pessimism about the power of education as an agent of social change now defined the mood of the times. Christopher Jencks argued, on the basis of large statistical data sets, that education did little to remedy social inequalities. Basil Bernstein’s seemingly prophetic argument that ‘education cannot compensate for society’, began to strike many chords, and Tom Popkewitz observed in retrospect that history repeatedly assigned misplaced faith in schools as agents of social redemption.
Once the crucible of social optimism, education now became a target of purging, despair and panic. In the United States, the dramatic report *A Nation at Risk*, proclaimed, in bellicose language, that Americans would be outraged if growing foreign superiority in educational achievement and economic performance had instead been one of military might. Meanwhile, in Britain, the incoming Conservative government of the late 1980s used the deliberately misspelt slogan ‘Education Isn’t Wurking’ as its election vote-grabber. Governments now started to link education more closely to business, work, science and technology. Structures were reorganized, resources pegged back, and policies of market choice and competition between schools began to proliferate. Curriculum control was often tightened and in some places linked to the explicit task of re-establishing pride in the nation. Change became ubiquitous and was implemented, ‘just in time’, with an escalating sense of urgency. And teachers were blamed for everything by governments, media and newly instituted league tables of school performance that shamed the ‘worst’ of them for failing their pupils (usually those in the poorest communities). According to some critics, these developments were deliberate measures designed to make teaching and state schooling unpopular, to encourage many parents to fund their own children’s education privately, and to force older, expensive teachers who were impeding the new reform agenda, into early retirement.

By the 1990s, the average age of teachers in many OECD (Organization for Economic Cooperation and Development) countries was well over 40. Under the pressures of reform, morale problems, stress levels and rates of teacher burnout, all increased – even in countries like Japan where educational reform cycles had started later. Many teachers started to feel de-professionalized as the effects of reform and restructuring began to bite. Teachers experienced more work, more regulation of their work, and more distractions from what they regarded to be core to their work (teaching children) by the bureaucratic and form-filling burdens of administrative decentralization. The funeral pyre of state education was starting to smoulder.

One of the strongest pretexts for school reform in western nations was the introduction of international test comparisons. The economic miracle of the Asian ‘tigers’ of Hong Kong, Singapore, Korea and Taiwan along with the rising sun of Japan led western policy makers to oversimplify and singularize the contributions of these societies’ educational systems to their economic success. International test results in mathematics and science provoked public anxiety and provided ammunition for many western governments to reform their educational systems. This led to greater standardization and micromanagement of teaching and learning through tightened inspection systems, performance-related pay, and closely scripted curriculum reforms that severely reduced the latitude of teachers’ pedagogical decisions – as in the widely used Success For All literacy programme in the United States,
and the United Kingdom’s National Literacy Strategy in primary schools. Ironically, however, the emerging knowledge economy actually needs much more flexibility in learning and teaching than these trends have allowed – as the unexpected economic downturns in and collapses of Asian currencies in the late 1990s, belatedly led people to recognize.23

Meanwhile, all the educational downsizing and restructuring seemed no more helpful for reversing or ameliorating educational and social inequality than the movement of deckchairs might have been for saving the Titanic. Rates of child poverty expanded and exploded in Britain, the United States and elsewhere.24 Restructuring measures showed little sign of narrowing the learning gap between schools in rich and poor communities.25 And in sub-Saharan Africa and parts of South America especially, a Fourth World of absolute destitution began to emerge.26 Here, strings of famines, disease and other ecological disasters as well as inter-tribal genocide, tragically characterized a post-colonial era where political dictatorships with corrupt regimes (often supported by western governments) divided their nations, marginalized their poor and personally sequestered most of the educational and other resources that economic aid agencies tried to give them. If teachers’ hopes for enhanced teacher professionalism were rarely being realized in developed nations, elsewhere they were an unattainable dream.

Profiting from the knowledge society

These have been the dubious educational legacies of the dying industrial and imperial era of modernization in the final quarter of the twentieth century. But at century’s turn, a new economy and society, emerging from the ashes of old industrialism, began to take shape.

In 1976, American sociologist Daniel Bell foretold this coming social age and invented a new phrase to describe it: the knowledge society. Bell’s book, The Coming of Post-industrial Society, charted an economic shift that had already begun: from an industrial economy where most people were engaged in producing things, to a post-industrial economy where the workforce was increasingly concentrated in services, ideas and communication.27 Much of this new emphasis, Bell argued, would be increasingly dependent on people and institutions that produced knowledge – in science, technology, research and development. ‘The post-industrial society’, he said, is a knowledge society in a double sense: first the sources of innovation are increasingly derived from research and development . . . second, the weight of the society – measured by a larger proportion of Gross National Product and a larger share of employment – is increasingly in the knowledge field.28
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The educational sphere alone, he argued, would mushroom as part of this trend, so that 'by the year 2000, the United States will have become . . . a mass knowledge society' with rocketing rates of enrolment in higher education.29

Bell’s prophecy was partially correct. Access to more and more years of state education, higher education and adult education continues to expand everywhere. Young people stay in school longer, enter higher education in greater numbers, and start full-time paid employment and careers later.30 But whether all this leads to a greater, better, more widely distributed knowledge society as a whole is an open question. More schooling does not always amount to better learning.

Today’s widespread talk about the knowledge society among politicians, bureaucrats, educators and entrepreneurs, broadens its meaning considerably beyond Bell’s. Today’s knowledge society is not just represented in the growth of particular expert sectors such as science, technology or education. It is not just a resource for work and production, but it permeates all parts of economic life, characterizing the very way that corporations and many other kinds of organizations operate.

Economist and nonagenarian futurist Peter Drucker has best captured and popularized this newer, more powerful and pervasive idea of the knowledge society. The basic economic resource of society, he says, is no longer capital or labour. Instead,

it is and will be knowledge . . . Value is now created by ‘productivity’ and ‘innovation’, both applications of knowledge to work. The leading groups of the knowledge society will be ‘knowledge workers’. . . The economic challenge . . . will therefore be the productivity of knowledge work and the knowledge worker.31

In his brilliant trilogy on the network society, Manuel Castells, an adviser in high-level expert think-tanks on social reform in eastern Europe and the less developed world, uses the term informational society to describe this new social and economic order.32 For Castells, this society is rooted in and driven by the development, expansion and circulation of globalized electronic, computer-based and digital information and entertainment.

In the industrial mode of development, the main source of productivity lies in the introduction of new energy sources, and in the ability to decentralize the use of energy throughout the production and circulation processes. In the new informational mode of development, the source of productivity lies in the technology of knowledge generation, information processing and symbolic communication . . . What is specific to the informational mode of development is the action of knowledge upon knowledge itself as the main source of productivity . . . in a virtuous circle of interaction.33
In this constantly changing, self-creating informational society, knowledge is a flexible, fluid, ever-expanding and ever-shifting resource. In the knowledge economy, people do not just draw on and use outside ‘expert’ knowledge from the universities and elsewhere. Knowledge, creativity and invention are intrinsic to everything people do. Knowledge is not only a support for work and production, as Bell first argued, but the key form of work and production itself, as more and more educated people work in the fields of ideas, communication, selling, marketing, counselling, consultancy, tourism, event organization and so forth. In one of Ian Rankin’s popular detective novels, his ageing protagonist, Inspector Rebus, scans the avant-garde occupations of the tenants of a fashionable Edinburgh apartment block where he is interviewing suspects and sarcastically wonders whether ‘anybody has real jobs any more!’

In the knowledge society, how we produce is linked to how we consume. Jeremy Rifkin’s book *The Age of Access* illustrates that while the downpayment prices of many of the things we purchase, such as cars, computers, and telephones, are falling or disappearing altogether, the services these things lock us into – car leasing, Internet access, telephone plans – are eating up more and more of our personal budgets. Service is at the core of economic success.

Robert Reich, Secretary of Labour in President Clinton’s administration, describes how profitability in the new economy depends not on old industrial economies of scale with their techniques of mass production and marketing, but rather, in a world of spiralling and capricious consumer choice, on companies inventing new products and services more quickly than their rivals. Competitive companies therefore rely on building cultures and systems of ‘continuous innovation’ where ‘speed and cleverness . . . count far more than production’. In this culture, ‘geeks’ who can invent, create and take all-consuming pleasure in novelty and seeking out new possibilities, are at a premium. So too are employees and experts who can empathize with clients’ needs; who can anticipate and foresee their future desires, and who can figure out what is most likely to titillate their consumer taste buds!

All this innovation and market anticipation calls for knowledge – and the greatest entrepreneurial geniuses like Thomas Edison, today’s Stephen Spielberg, or Oprah Winfrey, says Reich, possess both kinds. But individual geniuses are rare. Successful corporations therefore bring innovators and marketers together, breaking down the old departmental divisions between marketing on the one hand and research and development on the other, that used to characterize corporations in the industrial era.

The best corporations in the knowledge economy therefore operate as learning organizations where innovators and marketers work in teams, enjoy ease of communication with each other, have regular access to outside knowledge and are able together to generate and apply new ideas. These
organizations build their capacity to share, create and apply new knowledge continuously over time. As Reich observes, ‘mutual learning that leads to continuous innovation tends to be informal, unplanned, serendipitous’. The organizational challenge is to create the groups and cultures in which this mutual, spontaneous learning can thrive. The success of Silicon Valley sprang from this very principle – being a community which brought together Stanford University researchers, technical innovators and venture capitalists in a newly developed industrial park that would have an historic worldwide impact on economic and technological change. More recently, the Santa Fe Institute draws on strong corporate financing from organizations like Motorola, to bring together theoretical physicists, economists and others in order to discover the secrets of the networks and patterns that evolve in chaotic and complex systems. It is understanding these emergent patterns in economic and social networks, the funders believe, that will hold the key to future economic success.

So the knowledge society has three dimensions. First, it comprises an expanded scientific, technical and educational sphere, in the way Daniel Bell described. Second, it involves complex ways of processing and circulating knowledge and information in a service-based economy. Third, it entails basic changes in how corporate organizations function so that they enhance continuous innovation in products and services, by creating systems, teams and cultures that maximize the opportunities for mutual, spontaneous learning.

The second and third aspects of the knowledge society depend on having a sophisticated infrastructure of information and communication technology that makes all this learning faster and easier. This informational infrastructure is crucial – and not only in the leading economies. Castells demonstrates that becoming electronically switched on to the knowledge or information society is just as important a priority in less developed countries. Those countries most excluded from the information economy, or which have been the latest starters with information technology, he shows, have fared least well economically. Indeed, failure to invest in information technology and to spread its access (with accompanying free flows of information) beyond the military to civil society, was one of the prime causes of the collapse of Soviet communism. Nations and groups that do not or cannot participate in the information society become increasingly marginalized by it.

The key to a strong knowledge economy, though, is not only whether people can access information, but also how well they can process that information. The OECD has been one of the prime movers behind new knowledge economy initiatives. In a significant position paper for the OECD, Martin Carnoy and Manuel Castells describe the information age as being centrally concerned with knowledge and learning:
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The distinguishing feature of work in the information age is the centrality of knowledge, especially ‘transportable’ general knowledge that is not specific to a single job or firm. The best jobs are those that require high levels of education (high levels of general knowledge) and provide opportunities to accumulate more knowledge. The best firms are those that create the best environment for teaching, learning, and interchanging information. It is knowledge and information that creates flexibility in work – the capacity of firms to improve product lines, production processes, and marketing strategies, all with the same work force; and the capacity of workers to learn new processes as they change; to shift jobs several times in the course of a work life; to move geographically, and, if necessary, to learn entirely new vocations.45

Developing the knowledge society

The knowledge society is a learning society. Economic success and a culture of continuous innovation depend on the capacity of workers to keep learning themselves and from each other. A knowledge economy runs not on machine power but on brain power – the power to think, learn and innovate. Industrial economies needed machine workers; knowledge economies need knowledge workers.46 Drucker puts it this way.

Knowledge workers will give the emerging knowledge society its character, its leadership and its profile. They may not be the ruling class of the knowledge society, but they are already its leading class.47 The influential report of the OECD Knowledge Management in the Learning Society links knowledge management to the challenges created by the acceleration of change:

We are moving into a ‘learning economy’ where the success of individuals, firms, regions and countries will reflect, more than anything else, their ability to learn. The speeding up of change reflects the rapid diffusion of information technology, the widening of the global marketplace . . . and deregulation of and less stability in markets.48 These trends, the OECD point out elsewhere, raise ‘profound questions for the kinds of knowledge pupils are being equipped with and ought to be equipped with, by schools’.49

International educational change expert Michael Fullan concludes that ‘knowledge-creation using the world of ideas about learning’ – including the best of brain research, cognitive science and so on – must be at the heart of teaching and schooling.50
Leading social theorists and policy advisers of all political stripes are recognizing that high-quality state education is essential to developing knowledge workers and the knowledge society everywhere. Castells advises that Education is the key quality of labour; the new producers of informational capitalism are those knowledge generators and information processors whose contribution is most valuable to the firm, the region and the national economy.51

Anthony Giddens, a leading 'guru' of Britain’s Prime Minister Tony Blair, also asserts that ‘improved education and skills training’ are essential, ‘particularly as far as poor groups are concerned’ – if they too are to benefit from and be included in the new economy. ‘Investment in education’, he continues, ‘is an imperative of government today, a key basis of the redistribution of possibilities’.52 Australian reform consultants Brian Caldwell and Jim Spinks argue that, after years of reform in education which have concentrated on making schools more self-managing, then directing their efforts to reaching performance targets and improving learning standards, the focus of policy efforts worldwide is now shifting to creating schools for the knowledge society.53

As I complete this book, I am speaking at the ceremonial opening of the National Institute of Education building in Singapore. Singapore is a tiny, young nation of 3 million people; barely a dot on the map. Having built its success on the large-scale production of electronic goods, Singapore faces particularly severe challenges in rebounding from the 1997 Asian economic and currency collapse that hit the electronics sector especially hard. Singapore’s neighbours can offer much cheaper labour to the international economy, and also, in China’s case, vast domestic markets.

The Singapore government realizes that its future prosperity depends not on educating its people in the knowledge and skills for a particular kind of economy, but in developing its people’s capacity for learning and dealing with change so they can respond quickly and flexibly, adapting and retraining as future economic opportunities or recessions arise.54 Singapore’s educational vision is therefore one of becoming a society that comprises ‘Thinking Schools [in a] Learning Nation’. The national curriculum is being cut back, flexibility and creativity are being encouraged, and a number of schools are being established and architecturally refitted as learning organizations. Almost $50 million has been dedicated to educational research. In other universities I have visited, improved buildings in engineering or science symbolize the belief of government that the future depends on technology. The creation of the Singapore National Institute of Education with over 360 faculty and 7000 students, symbolizes its government’s belief that the nation’s future depends on its people. Many other Asian nations, such as Japan, whose models of standardized competitiveness
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the West has tried so hard to emulate, are now also reducing the quantity of prescribed curriculum content, promoting more teacher flexibility and urging greater classroom creativity.

National educational policies that are driven by market fundamentalism – the unshakeable belief, even against the evidence, that unfettered markets offer the best path to prosperity – downsize their systems to produce basic, standardized achievements and reduce costs in order to free up the economy. But an advanced knowledge economy needs an educational system, built by the state, that will actively fuel and not merely free up the economy. Phillip Brown and Hugh Lauder argue that, ‘in a knowledge-driven economy characterized by rapid change, adequate job performance cannot easily rely on external controls, as people need to be proactive, solve problems and work in teams.’ Classroom performance can no longer rely on these controls either.

Writers and policy makers of quite different ideological persuasions increasingly concur that a strong and improved state educational system is essential to producing a vigorous knowledge economy and to enabling poorer communities and countries to participate in and not be marginalized by it. In later chapters, we will see that all that glitters in the knowledge economy is not gold, and that the age of information brings real threats as well as benefits to human experience and opportunity. But schools and their teachers cannot and should not stand aside from their responsibilities to promote young people’s opportunities in, engagements with and inclusion within the high-skill world of knowledge, information, communication and innovation. All children must be properly prepared for the knowledge society and its economy.

More education in existing forms is not the answer, though. More efficient classrooms that concentrate on teaching and learning rather than behaviour management; more time spent on literacy and other basics; more summer schools and Saturday schools for pupils who are slower at learning; more hours in the school day, more days in the school year – all these things do help to increase pupil achievement, but only achievement of existing kinds. They do not change what pupils are achieving by subjecting them to more of the same.

In an earlier book, I described how schools that were preparing young people for the rapid change and complexity of a postmodern, post-industrial world, were actually locked in modern, even premodern principles of the factory and the monastery. Schools were still ruled by clocks and bells, periods and classes, where children were grouped by age, taught memorizable knowledge, through a standardized curriculum that was conventionally tested. Much of this conventional ‘modernism’ of our school systems persists through the actions of professionals and bureaucrats who look inwards to the custom and certainty of their own expertise.
and routines, rather than outwards to the concerns of pupils, families and communities.

Today’s schools and school systems are a tragic example of what Canadian political scientist Thomas Homer-Dixon calls an ‘ingenuity gap’ in society. Building on current thinking in geography, environmental studies, political science and brain psychology, Homer-Dixon argues that our world is increasingly complex, interdependent and fast-paced, generating a profusion of urgent and unpredictable problems that demand instant and effective responses. Instantaneous and endless stock market trading and speculation across the globe means that currency crises in Thailand or Argentina can immediately undermine confidence in economies elsewhere. Global warming produced by carbon dioxide on one part of the planet, and the disappearance of rainforests in another, create floods and gales in a third. The frog population is disappearing everywhere and we have no idea why. The world’s systems are more interdependent than ever before – and so are its problems. In the computer age, there is more and more information and data to help people address and respond to these problems, but this information glut, or ‘data smog’ can itself become part of the problem as it assails us in ever greater quantities with increasing rapidity. Stock market traders, even advertising executives, are getting younger and younger as the brains of only the young and the nimble can manage the multiple channels of data, ideas and communications that make up their workplace. In organizations critical to society’s economic well-being, key workers may be smarter and able to work faster, but are less wise and less capable of drawing on experience and institutional memory to influence their judgement.

What the knowledge society needs, says Homer-Dixon, is lots of ingenuity. He defines ingenuity as

ideas that can be applied to solve practical, technical and social problems, such as the problems that arise from water pollution, cropland erosion and the like. Ingenuity includes not only truly new ideas – often called ‘innovation’ – but also ideas that though not fundamentally novel are nevertheless useful.

Ideas, says Homer-Dixon, ‘are a factor of economic production just like labour and capital’. What matters is getting an ‘adequate flow of the right kind of ideas’ and understanding the factors that govern that flow. Ingenuity can be technical in dealing with the physical world, or social in dealing with organizations, institutions and communities. The fundamental problem, Homer-Dixon concludes, is that while, in today’s complex world, we need a greater supply of social ingenuity in particular, the ingenuity we can create is falling far short of the overwhelming demand for it. This shortfall between the rapidly rising need for ingenuity and its inadequate supply is what Homer-Dixon means by the ingenuity gap.
and Manuel Castells make the same point in their OECD position paper when they remark that ‘men’s and women’s work is being transformed by new technologies but the social institutions needed to support this change are lagging far behind.’

The integration (or non-integration) of information and computer technology into secondary schools provides a striking example of the failure of ingenuity in educational change. At one level, the growth of computer technology in schools has been phenomenal. As recently as the mid-1980s, when my children attended a highly innovative primary school in England, they would be sent once or twice a week by their teacher to bring the solitary school computer on its trolley from the other side of the building – and they would use it to work with small groups of peers, just 5 or 6 years old, on composing and redrafting pieces of writing. In England and many other developed western nations, almost every school is now directly wired to the Internet. The problems of technical ingenuity in using information technology in schools are no longer great. The major problems are with social and organizational ingenuity.

Primary schools, especially, have often shown great ingenuity in putting computers into regular classrooms, and integrating them within flexible processes of teaching and learning. In secondary schools, however, computers have usually been installed not in classrooms, but in separate computer laboratories. Why? Because in this way, the traditional grammar of schooling with its one-subject, one-teacher, one-class system is left intact. Computer use by pupils is confined to special sessions during the week where particular classes are all scheduled into the computer lab together, or to assignments that pupils undertake individually, after school, in their own time. The rest of the time, teaching and learning proceed as they have done for decades. The absent computer, safely locked in its laboratory, provides no challenge to them.

The regulations and routines of factories, monasteries and self-perpetuating bureaucracies provide young people with poor preparation for a highly innovative, flexible, and team-based knowledge economy where routine is the enemy of risk. Not surprisingly, advocates of the knowledge society have a jaundiced view of present state school systems. ‘Pitiful’, is what English futurist Charles Leadbeater calls them. Yet, beyond proposing to move more learning out of the school and the classroom, or getting more people to invest in their own learning, Leadbeater’s ideas about how to reform the state system itself are disappointingly sketchy. He can only advise that

The point of education should not be to inculcate a body of knowledge, but to develop capabilities: the basic ones of literacy and numeracy as well as the capability to act responsibly towards others,
to take initiative, and to work creatively and collaboratively. The most important capability . . . is the ability and yearning to carry on learning.67

By themselves, bland recommendations such as these do little to change the realities of state education. Nor does providing people with more exit routes to escape from it. Instead, we urgently need more specific and inspiring ideas about how to transform learning and teaching within state education itself.

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What might it mean in practical terms for teachers to be catalysts of the knowledge society, to be the key agents who can bring it into being? How would this mandate affect their role, as well as their own and other people’s understandings of what being a professional entails?

In general, as catalysts of successful knowledge societies, teachers must be able to build a special kind of professionalism. This cannot be the professionalism of old where teachers had the autonomy to teach in the ways they wished, or that were most familiar to them. There is no value in reviving the Julie Andrews curriculum – ‘these are few of my favourite things’ – where teachers could teach anything they liked. Rather, teachers must build a new professionalism, the main components of which are outlined in Table 1.1.

More and more governments, businesses and educators are urging teachers in the knowledge society to commit themselves to standards-based learning, where all pupils (not just a few) achieve high standards of cognitive learning, and where they create knowledge, apply it to unfamiliar problems and communicate it effectively to others, instead of treating knowledge only as something that pupils should memorize and regurgitate.68 New

Table 1.1 Teachers as catalysts of the knowledge society

- Promote deep cognitive learning
- Learn to teach in ways they were not taught
- Commit to continuous professional learning
- Work and learn in collegial teams
- Treat parents as partners in learning
- Develop and draw on collective intelligence
- Build a capacity for change and risk
- Foster trust in processes
approaches to learning necessitate new approaches to teaching. These include teaching that emphasizes higher-order thinking skills, metacognition (thinking about thinking), constructivist approaches to learning and understanding, brain-based learning, cooperative learning strategies, multiple intelligences and different ‘habits of mind’, employing a wide range of assessment techniques, and using computer-based and other information technologies that enable pupils to access information independently.

For many teachers, the impact of new developments in the science of learning has meant learning to teach differently from how they were taught as pupils. In the past, teachers learned the rudiments of teaching by watching the teachers who taught them. Teaching for today’s knowledge society is technically more complex and wide-ranging than teaching has ever been. It draws on a base of research and experience about effective teaching that is always changing and expanding. Today’s teachers therefore need to be committed to and continually engaged in pursuing, upgrading, self-monitoring and reviewing their own professional learning. This includes, but is not restricted to, participating in face-to-face and virtual professional learning networks, adopting continuous professional development portfolios where teachers accumulate and review their own professional learning, consulting and critically applying the evidence of educational research so their practice is always informed by it, undertaking action research and inquiry of their own, and connecting professional learning with levels of reward in teacher pay.

Teachers can no longer take refuge in the basic premises of the pre-professional age: that teaching is managerially hard but technically simple; that once you have qualified to teach, you know the basics of teaching for ever; and that from then on, teaching is something you work at improving by yourself, through trial and error, in your own classes. I would be horrified if my dentist approached his professional learning like this. From time to time, I ask him how he goes about improving as a dentist. I am relieved he does not reveal that he mainly improves by trial and error, and that if his innovations do not generate shrieks of pain, he knows he is probably on the right track. Instead, he reports that he gets better by reading new research about dentistry, undertaking training in new technology or pain management, watching expert dentists practise at the hospital, or talking about dentistry with his colleagues.

If my dentist does not pursue his own learning, his insurance premiums increase hugely. He becomes a liability to his patients. Teachers who do not keep learning by more than trial and error are a liability to their pupils. For this reason, professional learning in teaching is an individual obligation as well as an institutional right.

The process of learning to improve as a teacher needs to become more like learning to get better as a dentist – and more: for teachers work in large
communities not just among small groups of individuals. Gary Hoban argues that schools, like other workplaces, must become sophisticated professional learning systems which are organized and structured to encourage professional learning for teachers, so that it becomes an endemic and spontaneous part of their work. In the complex, fast-changing knowledge society, teachers, like other workers, cannot work and learn entirely alone or just on separate training courses. No one teacher knows enough to cope or improve by themself. It is vital that teachers engage in action, inquiry and problem-solving together in collegial teams or professional learning communities. Through such teams, teachers can undertake joint curriculum development, respond effectively and creatively to external reform imperatives, engage in collaborative action research, and analyse pupil achievement data together in ways that benefit their pupils’ learning.

Knowledge economies and knowledge economy organizations operate not just by sponsoring know-what, know-why or know-how, but also by developing the capacities of what the OECD calls ‘know-who’. Know-who involves the methods and dispositions of accessing explicit and also tacit knowledge from others.

Know-who involves information about who knows what and who knows what to do. But it also involves the social ability to cooperate and communicate with different kinds of people and experts.

Over the past decade, teachers in many countries have indeed become more expert at and experienced in working with their colleagues. They have helped to reculture the profession so that working effectively with adults outside the classroom is as essential as working effectively with children within it. But while teachers have made great strides at developing learning relationships with their colleagues, they have been much less effective at doing so with parents. As we reach for higher standards and deeper learning in the knowledge society, treating parents as indispensable assets who support their children’s learning is essential. Some practical steps include developing interactive report cards, sharing computerized pupil and school performance data openly and instantly with parents, creating schemes that promote parents’ involvement in their children’s literacy, setting shared homework assignments to be undertaken by children and their parents together, and offering workshops to parents on new developments in curriculum, teaching and learning. While specific measures can vary, what matters in the knowledge society is that parents become part of the school’s extended web of learning, and that teachers extend their sense of professionalism to include and embrace these broader learning partnerships.

Developing and managing effective teamwork, problem-solving and mutual learning among adults calls for a high degree of what Daniel Goleman calls emotional intelligence. In his best-selling texts, Goleman argues that...
mastering a set of emotional competences significantly improves work performance and personal relationships. Emotional intelligence, he claims, adds value to cognitive intelligence. It distinguishes leaders who are stars from ones who are merely adequate. The five basic competences that make up emotional intelligence are:

- knowing and being able to express one’s own emotions;
- being able to empathize with others’ emotions;
- being able to monitor and regulate one’s emotions so they do not get out of control;
- having the capacity to motivate oneself and others; and
- possessing the social skills to put the first four competences into action.

All these aspects of emotional intelligence enable workers and managers to motivate and improve their relationships with colleagues, bounce back from adversity, work through the difficulties and disappointing moments of change, build high-performing teams, solve problems effectively, value the diverse learning styles and cultural backgrounds of team-mates, and be able to resolve conflicts when they arise. Emotional intelligence is as important in a school classroom or staffroom as it is in a corporate office. Emotional competences, says Goleman, improve our organizations and relationships. In the knowledge society, they are an essential end of classroom learning and not just a context or climate for that learning. Emotional intelligence provides the emotional foundations for shared professional learning and teamwork among teachers. This is why Michael Fullan and I explicitly advocate that teachers and leaders develop their own and others’ emotional intelligence.

Phillip Brown and Hugh Lauder expand this argument and claim that successful, high-skill knowledge economies depend on their societies’ abilities to create and pool what they call collective intelligence:

Collective intelligence involves a transformation in the way we think about human capability. It suggests that all are capable rather than a few; that intelligence is multiple rather than a matter of solving puzzles with only one right answer; and that our human qualities for imagination and emotional engagement are as important as our ability to become technical experts.

The development and pooling of collective intelligence will, they say, ‘become the ultimate source of economic security in a global economy’. The key for the high-skill economy and its educational system is grasping that intelligence is not scarce, singular, fixed and individual. Collective intelligence rather, is universal, multiple, infinite and shared. Schools that are learning organizations for everyone build the capacity to develop these essentials of collective intelligence.
The knowledge society is a changing society in which information expands rapidly and circulates continuously around the globe; money and capital flow in a restless and relentless search for new investment opportunities; organizations continually restructure themselves; government policies undergo volatile shifts as electorates become more and more capricious; and multicultural migration keeps reconstituting the communities in which we live. Schools are not immune to all of this, and in a constantly changing world with expanding knowledge, shifting communities, and volatile seesaw politics in education, teachers in the knowledge society must develop and be helped to develop capacities for taking risks, dealing with change, and undertaking inquiries when new demands and novel problems repeatedly confront them. There is no creativity without risk – the risk of trying a new idea, experimenting with an unfamiliar practice, being prepared to fail or look silly when trying something new, not taking setbacks to heart, being responsive rather than overly sensitive to critical feedback, working with and seeking advice from colleagues who are different as well as colleagues who share one’s own convictions, and so on. If we are to encourage pupils to be risk takers, teachers must be risk takers too. Teaching is not a place for shrinking violets, for the overly sensitive, for people who are more comfortable with dependent children than they are with independent adults. It is a job for grown-ups, requiring grown-up norms of how to work together.

In teaching, risk requires a special kind of trust in processes as well as people. This professional trust is not a matter of passive blind faith in others, but involves active commitments to shared work, openness and reciprocal learning. This means teachers trusting people who may not be well known to them, who are not familiar friends, whose predictability and reliability have not been proven many times in the past. In large, complex and rapidly changing organizations, it is not enough to trust and work closely only with small circles of friends, such as a well-liked team-teaching partner.

In another study, where I examined the emotional aspect of teachers’ relations with their colleagues, one of the strongest causes of positive emotion was when teachers’ colleagues agreed with them, shared the same goals, completed each other’s sentences, or felt like they were in a marriage. What teachers disliked most was conflict with their colleagues. So they learned to avoid situations that might expose differences or provoke disagreement between them.

In Africa recently, I was taken out on a game reserve. Our tracker stopped by a herd of impala. Nearby, we heard the blood-curdling call of a jackal. ‘Why’s he howling?’ we asked. ‘The jackal is calling for the cheetah,’ the tracker replied, ‘to show him where the game is.’ The cheetah needs the jackal to find his game. The jackal needs the cheetah to kill it for him. They
need each other to survive. This collaborative animal behaviour demonstrates the basics of professional trust.

If teachers want to make progress as professionals and have an impact in the complex world of schools, they must learn to trust and value colleagues who are distant and different from them as well as ones who are the same. This professional trust moves people into the realm of the uncertain and unknown and in that sense ‘involves a willingness to take risks or to place oneself in a vulnerable situation’. Teamwork, learning from people who are different, sharing information openly – all of these essential ingredients of the knowledge society involve vulnerability, risk and a willingness to trust that the processes of teamwork and partnership will ultimately work for the good of all, including oneself.

Professional learning can take many forms – informal learning from colleagues or more formal learning from data and evidence. David Hargreaves complains that the practice of teaching has not been as well grounded in research evidence as the practice of doctors. This, he says, is partly a problem of the teacher culture that has looked askance at research evidence compared with teachers’ own experiential judgements, but it is also a fault of the educational research community itself whose work often has little direct value for or accessibility to practitioners. More evidence-based or evidence-informed practice need not lead to dependency on and deference to outside research, though. Teachers themselves, says Hargreaves, can be more involved in teacher research than they have been. As strong communities, teachers can also have the competence and confidence to engage critically, not compliantly, with the research that informs their practice. But in a knowledge society, evidence as well as experience must significantly inform schools’ efforts to improve.

Teachers who are catalysts of the knowledge society must therefore try to make their schools into learning organizations where capacities to learn and structures that support learning and respond constructively to change are widespread among adults as well as among children. Schools that are good learning institutions for children must be effective learning organizations for teachers and leaders too. Chapter 5 looks in detail at a school that has been deliberately established as a learning organization.

All in all, teaching in and for the knowledge society is concerned with sophisticated cognitive learning, an expanding and changing repertoire of research-informed teaching practices, continuous professional learning and self-monitoring, teamwork, learning partnerships with parents, developing and using collective intelligence, and cultivating a profession that values problem-solving, risk-taking, professional trust, coping with change and committing to continuous improvement. In short, teaching for the knowledge economy fosters and thrives on:
• creativity
• flexibility
• problem-solving
• ingenuity
• collective intelligence
• professional trust
• risk-taking
• continuous improvement.

Although they may be difficult to put into practice, these qualities seem to comprise a set of professional virtues that are beyond argument. Who would not want learning and teaching to be like this? The problem, it would seem, is not adjudicating on the merits of these components, but only how to bring them into being. This, however, is a dangerous and misleading assumption, as we shall see next.