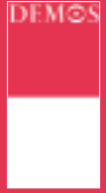**innovation**

DEMOS

Working laterally:
how innovation networks make an education epidemic

David H Hargreaves

teachers transforming teaching

Helping students to learn better is on everybody's agenda, and there are many different views about how this is best achieved.

For a teacher, finding ways of doing the job better has always been natural. Even when teaching has been externally constrained or prescribed, as with the literacy, numeracy or key stage three strategies, teachers have to improvise to make it work with their students in the specific context of the lesson. Much of this creative innovation is locked in the heads of individual teachers: they do not know whether what they do is especially good practice; and even when it is known to be good, a practice spreads very slowly, if at all, within a school, let alone between schools. In other professional worlds, such as medicine or business, innovation has been developed in a much more explicit and co-ordinated way and then disseminated much faster than in education. Could this be made to happen among teachers too?

The time is ripe for exploring new ways in which to increase teachers' professional knowledge and skill. Recently education ministers and the DfES have been talking less about school improvement and more about the transformation of schools. Ministers declare the importance of innovation and have established the Innovation Unit. Transformation suggests that improvement should be faster and done in a way that allows innovation to flourish, to be shown to work and to spread through the profession. Here we explore how teachers can move beyond private improvisation to engage in planned innovation and to do so in and through professional networks. We shall explore some of the opportunities and challenges that innovation networks offer to teachers committed to making schools better places for staff and students.

'Educational processes are complex, so the amount of improvement any single strategy can effect is small. To maintain the momentum, new approaches are needed.'

The challenge of transformation

There are several drivers of this need for deep change. One driver is the recognition by many countries that more people should be better educated than ever before, so all now strive to create 'world-class' education systems. England has achieved well in international comparisons, but there is room for further development.

Another driver is the growing recognition that in a knowledge-based economy more people need to be more creative and this will in itself require new approaches to teaching. England sought to reach the levels of literacy and numeracy that had been achieved in Germany and some South East Asian countries. Without reducing the importance of the basics, we must now aspire to nurture through education the qualities of creativity, innovativeness and enterprise.

A third driver is the acknowledgment that the recent improvement strategies have inevitable limitations. Between 1997 and 2002, the literacy and numeracy strategies in primary schools were among the most impressive of the government's achievements. But the rate of improvement has been levelling off. All strategies have their limits. Educational processes are complex, so the amount of improvement any single strategy can effect is small. To maintain the momentum, new approaches are needed.

A fourth driver is that the improvements already achieved have not closed the gap in educational achievement between the most and least advantaged. There are some real achievements by the government, for example in Excellence in Cities, but there is more to do.

Do you think there are other factors driving this idea of transformation?

Why innovation networks?

First, why should teachers innovate at all?

- Teachers do it anyway. As teachers adjust materials or ways of organizing lessons to help pupils learn, their improvisations are a form of innovation.

  Without this creative capacity to innovate, a teacher does not succeed in the profession.

- Innovation is essential to improving one's professional skills and to adapting to meet changing circumstances.

  Innovation is a way of learning professionally.

- Innovation empowers staff and is highly rewarding professionally.

  To see how being creative and innovative makes a difference for pupils is one of the joys of teaching.

- In our knowledge-based economy, students need to be innovative to succeed at work and in life.

  When staff actively model innovative behaviour in school, students learn why innovation matters and is something they can do too.

Secondly, why network?

- To transform schools so that there is yet better teaching and learning, teachers must work smarter, not harder.

  Today, most innovation is the activity of networked teams, not individuals.

- Teachers need to share good practice and transfer it rapidly.

  Lateral networks do this more effectively than top-down hierarchies.

- Government needs to empower teachers to use their creativity in the task of transformation.

  Networks of peers feed the creative co-production of new knowledge that is the source of better professional practice and renewed professional pride.

A key to successful innovation is therefore combining innovation with networks.

Are there further arguments in favour of innovation networks? Are there any risks and dangers in networking?

What is innovation?

The text-book definition is that innovation is *the exploitation of a new idea that through practical action adds value to a product, process or service*. In education, of course, we rarely create a new product: but teachers constantly make process innovations (the way they teach or design lessons, the school day or year) and services (the way they advise and support students and parents).

Under the umbrella of *school transformation*, it might be simpler to say that for teachers innovation is mainly a matter of *learning to do things differently in order to do them better*. For teachers, most innovation is the creation of new professional knowledge about their work.

One needs to think through the *extent* of innovation that might be involved. There's a common distinction between *radical* innovation, where there's a discontinuity between the new practice and the one it displaces, and *incremental* innovation, where there's a bit-by-bit evolution of a practice into something better. In Figure 1, the difference is explained in relation to what teachers do. The vertical axis refers to change that is either close to, or far from, teachers' current professional practices; and the horizontal axis to the depth of the change. Incremental innovation is a minor change close to existing practice, and radical innovation is a major change far from existing practice. Each axis is really a continuum, so that the diagonal line is a kind of innovation scale,

Figure 1: The nature of innovation

Minor change | Major change

Near to existing practice — Incremental innovation

Far from existing practice — Radical innovation
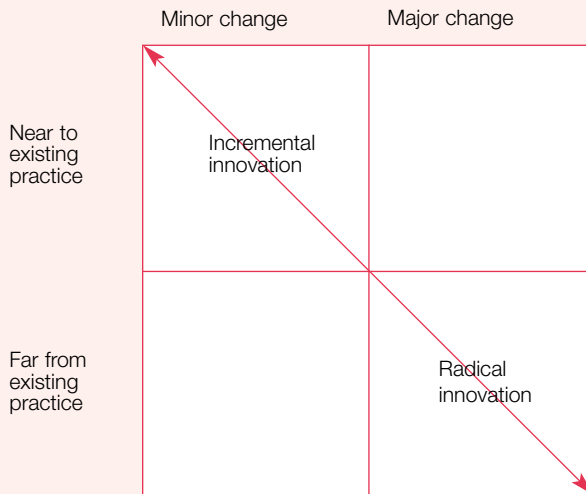
going from small incremental innovations in the top left corner to huge radical innovations in the bottom right corner.

There are also different *types* of innovation. We often think of innovation as *technological*. Some technological innovations are truly radical, such as the jet engine or the mobile telephone. Radical innovations are often followed by incremental innovation. Though resisted in its earliest conception, the arrival and widespread acceptance of the mobile phone has been followed by multiple minor incremental innovations to improve each firm's market position. Often, the technology follows a breakthrough in the underlying *science*: biotechnology and pharmaceuticals frequently depend on advances in 'pure' science. ICT opens the door to many technological innovations in schools and the rapid advances in the neurosciences may soon make an impact in education.

But there are radical innovations quite unlike the scientific-technological kind. The development in medicine of the randomised controlled trial, which gained acceptance only after the highly successful trial of streptomycin to treat pulmonary tuberculosis in the 1940s, was a radical innovation, and it quickly became the gold standard to ascertain the clinical effectiveness of new developments. No technology is involved here: it is a radical innovation in *professional methodology*. Here may lie the greatest potential to achieve the innovation for educational transformation.

Other radical innovations consist of an *importation* of what is widely accepted in one field but is radical in another: the steam engine was used in mines for 75 years before it was imported by another industry and adapted to propel boats. Teachers should not close their minds to stealing innovations from other professions or workplaces.

In the business world many firms have gone through deep organisational changes over recent decades. They are very unlike the companies – often factories – of fifty or a hundred years ago. By contrast, many schools are surprisingly similar to the schools created by the industrial revolution. So innovation in education might mean a very different kind of *organisation* for the school.

As we shall see, deciding on the *extent* and *type* of innovation is a key decision for a school or teacher embarking on transformation. Before that we shall explore the question of whether a school has the *capacity* to engage in innovation.

> *How would you set about deciding how much innovation of what kind you and your school could manage successfully? Can you afford not to innovate?*

Capacity for transformation – a new approach

We have become used to analysing effective schools as a set of characteristics, such as having an achievement culture or being well led by the headteacher, that every school could potentially adopt to raise standards. There is another way of approaching this question. Schools, like other organisations, are effective to the extent that they mobilise the range of resources at their disposal in effective and efficient ways. Suppose we treated these resources as forms of *capital*.

The most familiar form is *material capital*, which includes financial capital as well as physical capital such as buildings and equipment. But people are a school's most important resource. So a second form is *intellectual capital*, which embraces the education and training of individuals as well as their knowledge, skills, capabilities, competences, talents, expertise, practices and routines. Intellectual capital is, in contrast to material capital, one of the organisation's *invisible* assets. Schools are evidently rich in the intellectual capital of the teachers and staff, but also of the students. Were a school to fail to monitor its budget or audit its accounts on a systematic and regular basis, it would be seriously negligent. But a school's intellectual capital, especially among the staff, is rarely monitored and audited.

Another of a school's invisible assets is its *social capital*, a term that covers the character and quality of the social relationships within an organisation. Culturally, social capital is the level of *trust* between head and staff and among the staff, between staff and students and among the student body as a whole. Structurally, it is the extent and quality of the internal *networks*, such as networks of teaching teams as well as informal networks of friends. A school that is rich in social capital has a strong sense of itself as a community, but also has many external networks with ties to other communities

The last form of capital is *organisational capital*, which refers to the knowledge and skill about how to deploy the school's intellectual and social capital to achieve the school's goals. Being rich in material, intellectual and social capital does not automatically mean that the school uses these resources fully: rather, the resources have to be actively mobilised, and organisational capital is the know-how needed to do so.

Effective schools deploy these four forms of capital to good effect: they have leaders who develop and use organisational capital to mobilise in full the intellectual and social capital so that the central goals of the school are achieved. The best school leaders know not only how to deploy the school's existing intellectual and social capital, *but also how to increase them*. This mobilisation

of capital and the knowledge of how to increase it is, quite simply, a measure of the organisation's *capacity* or growth potential, especially the capacity to manage change and transformation, which demands, and is fuelled by, high levels of social and intellectual capital.

This capacity, as indicated by high levels of intellectual and social capital, is a precondition for making innovation networks succeed. There is also a welcome paradox here, for once innovation networks are alive and working, then their activity serves to increase the level of the capital on which they feed. In other words, you need high levels of capital to fuel innovation networks, but the networks generate more capital rather than depleting it. Investing in intellectual and social capital pays dividends.

We shall see how this works out in practice, as we explore the four conditions required to achieve transformation through innovation networks.

Do the four kinds of capital help you to judge the capacity of your school for innovation? How strong are the intellectual, social and organisation capital in your school? What could be done to increase them?

The first transformation – creating the right climate

Innovation is a delicate plant that needs a favourable climate if it is to thrive. It grows in stages, beginning with the perception that something needs to change, and so stimulating the bright ideas about what might be done. Each idea is thought through and tested out, and then either dropped because it's no good or further developed because it promises to work. Once proved, it's disseminated or transferred to those people or places where it can be used to advantage. There are thus three key phases in innovation: the *generation* of the idea; its *application* in practice; and its *transfer* into widespread adoption.

In each phase, innovation is easily stifled. Each phase requires creativity – not just thinking up the original idea. Innovation involves risk-taking: there cannot be innovation that is risk-free. The climate that is most harmful to innovation is a blame culture, which discourages the creation of new knowledge and undermines the courage needed to take the process through to application and transfer.

Many teachers feel the climate has for too long been one of blame. Innovation never disappeared from English schools, but it tended to go underground. Such covert,

personalised, micro-innovation is no longer adequate to the task of transforming schools, which will now need to create and sustain an explicit climate of experimentation and planned innovation. The centre cannot devise enough innovation across the whole range of teacher practices to implement the demanded rate of change. If teachers are to take ownership of reform through innovation in their practices, they must play a part in the creation of them.

An essential task for government is to create a climate in which it is possible to promote among teachers:

- the *motivation* to create new professional knowledge;

- the *opportunity* to engage actively in innovation;

- the *skills* for testing the validity of the new knowledge;

- the *means* for transferring the validated innovations rapidly within their school and into other schools.

This means that government must give active permission to schools to innovate and provide a climate in which risk taking that is carefully calculated is a normal part of innovation and failure is a necessary element in making progress – as is the case in the business world. In the words of the great Thomas Edison, '*You must learn to fail intelligently. Failing is one of the greatest arts in the world. One fails forward towards success*'. Without more trust in teachers from the government – giving the whole system more social capital – teachers will avoid taking risks and hide mistakes. To capitalise on the advantage that trust confers in fostering innovation, fear of failure has to be removed. This means using what turns out not to work as an occasion for learning: failures are acceptable provided that they are a means to improvement.

What action might you take to create the right climate for innovation in your school? How can teachers take risks with what they do but do so in a way that is ethical and protects the best interests of students?

The second transformation – disciplining innovation

How much innovation can a school or teacher cope with? How does one decide the extent of innovation and choose the types of innovation, as described earlier. The essential first step for an innovative school is to avoid innovation overload and excessive diversity by choosing and agreeing upon a limited focus or content for the main innovative activity that can be well managed. A school that encourages every member of staff to innovate on any preferred area squanders its efforts on half-baked innovations that never get fully developed.

Moreover, if every school creates it own agenda for innovation it would unleash a spate of unco-ordinated and unfocused innovation in the 1960s spirit of letting a thousand flowers bloom. The result will not be a strong evidence base of how to do things differently to guarantee doing them better. If teachers launch a new era of innovation, it is absolutely essential it be undertaken in a disciplined way.

So we must think through which aspects are most valuable as themes for innovation. Limiting the content means deciding on priorities. This can be done through a professional knowledge audit to clarify what teachers know how to do well and what they do not know or do not do well. Every school has to pose the questions:

what is the most important and urgent problem area and where do we think we could innovate successfully?
This can be achieved when every school explores three questions:

- What do we need to know to be better equipped in this problem area?

- What do we currently know about this problem area?

- What do we need to do to close the gap?

And this can be collated to provide a picture of the overall needs of a group of schools – a network such as an LEA or other form of collegiate or collaborative cluster. Choice of innovation will be more successful if it meets the agreed needs of a network working on it collectively. Schools in the network will contribute differently to the innovation. Some will contribute more than others: leading edge schools are expected to take a bigger than average share. The area for innovation can be divided up so each school develops just *part* of the innovation, with the pieces being assembled later to produce an innovation that no single school would dare to tackle. Transformation involves schools getting together in networks to innovate in a disciplined way rather than each one re-inventing the wheel.

Innovation means developing better practice, but what is meant by 'good practice'? Sometimes it refers to standard practices that are considered effective, part of a profession's repertoire or 'custom

and practice'. It's difficult for most schools to judge how they fare against current 'good' or 'best' practice, since they have relatively superficial knowledge of what's done in other institutions. Sometimes the term refers to a new practice that is thought to be more effective than the standard: many innovations fall into this category, especially when they remain untested but are advocated by their creators. However, greater effectiveness is not necessarily more efficient. For example, a new practice for the teacher may help a student learn better, but the demands on the teacher, in terms of time or energy, may be so great that the costs of the new practice outweigh the benefits. For a practice to be a good one it should have *high leverage*, that is, it should have a large effect for a small input of energy. A new practice of low leverage, where the energy input is disproportionate to the outcome achieved, hardly qualifies as 'good practice'. High leverage is the key to teachers working smarter, not harder. So innovation must be disciplined enough to create high leverage practices: it is pointless to disseminate poor practice – or even good practices that make impossible demands to implement.

Whenever teachers engage in innovation they must be provided with the necessary opportunities. Experimentation in pursuit of innovation cannot be done in addition to normal work, but must be embedded in the routine. At the heart of this is trying new ways in classrooms and devising how teachers can work together and reflect together. Each stage of the knowledge creation process takes time: generating new ideas; testing them in application; and transferring the outcomes to others. Innovation doesn't work when teachers feel over-worked, jaded and neglected, and when they are not recognised for it.

Remember too that when a school in difficulty adopts effective practices that are well established in another school, this change represents an innovation for the staff involved: what is 'old hat' to high performing schools may seem dramatically new and different to those struggling against the odds. This learning from others, this adoption of second-hand practices, might be called *transferred innovation*. Not all schools could or should be deeply engaged in front-line or pioneering innovation. Transformation depends crucially on the capacity of the system to manage transferred innovation. It is additionally advantageous if a set of good practices in a particular area can be scrutinised to determine which of the set is indeed the best practice. This is best achieved where schools work in collaborative networks.

What action might be taken in your school, in association with other network members, to provide the right opportunities for innovation that is highly disciplined?

The third transformation – going lateral

Transferred innovation is a simple idea, but moving knowledge is difficult in practice. The sharing of 'good practice' and 'the dissemination of best practice' is widely advocated. Unfortunately our knowledge of how to do this is frighteningly slight.

Some innovations and new practices are more transferable than others. A practice confined to a few people in a restricted range of circumstances may not be a good practice of much wider value. What works for a primary school teacher may not work for a sixth-form teacher, and what works in a rural area may not transfer to the inner city.

Moreover, when a practice is transferred, the teachers receiving it have to *choose* to adopt it and they will do so if it seems likely to make their lives better or easier in some way. Teachers don't mind doing something that's unfamiliar and difficult, provided that they see some real benefit to students and that the effort demanded isn't unreasonable. But a new practice should preferably not be an *additional* practice, but one that *replaces* an older one that is less effective. Older and more experienced teachers necessarily have, in the face of innovation, more to abandon than younger or less experienced colleagues, so an innovation of demonstrable high leverage is more likely to ease abandonment.

Common methods of transfer rely on the documentation of good practice in glossy booklets, websites, videos, etc. These are weak mechanisms for disseminating new practices for two main reasons: first, the source may lack credibility in the eyes of the teacher; and secondly, it's very hard to transfer knowledge that is disembodied and de-contextualised.

The best way to spread new practices that people choose voluntarily is on a *peer-to-peer basis*. Innovations have to catch on, like best-selling books, because they are what everybody is excited about, or are caught from personal contact, like a virus. It helps if within a network there are recognised 'champions' of the good/best practices. Practitioner-champions, including advanced skills teachers, who have devised and successfully applied the innovation with known beneficial outcomes, have most credibility. Alongside them are advocate-champions, such as LEA advisers or academic researchers, who are known and trusted.

Transfer often needs a real encounter or face-to-face relationship between the people involved. Although the idea behind an innovation is easy to describe, the way in which it is implemented or applied in practice depends in part on tacit knowledge – the kind of knowledge that is hard to put into words, such as the knowledge of how to ride a bicycle. So best practice has to be *demonstrated*, not just explained, and its replication by another practitioner in somewhat different circumstances has to be *practised* through trial and error and this entails *creatively*

adapting the innovation that is being transferred. The donor and the recipient in the transfer process need to spend some time together if the transfer is to be successful, since just as the donor had to engage in learning to develop the innovation, so too must the recipient learn during the transfer. What now seems simple to the experienced innovator is likely to seem complicated to the novice. The donor needs to offer the necessary mentoring, coaching and shadowing, and the recipient needs to make adjustments so that the innovation works in its new setting. Innovation transfer succeeds when the knowledge involved remains embodied and contextualised in a working relationship that is co-creative for both participants. It is often not a case of one teacher teaching another, but of both parties learning.

Innovation networks are not only powerful ways of generating high quality innovation, but are also the most effective way of creating the peer-to-peer epidemic by which they spread. This means using all the existing LEA/LLSC networks and professional networks such as subject associations, the Specialist Schools Trust, the British Educational Communications and Technology Agency (Becta), Excellence in Cities, Leadership Incentive Grant clusters, and many different consortia, collegiates and federations. The National College for School Leadership's Networked Learning Communities are especially valuable here. Innovation networks increase each school's intellectual and social capital but also boost the intellectual and social capital of the system as a whole.

The fourth transformation – using ICT

What contribution have ICTs to make to transformation and to a lateral strategy? The huge potential of the new technologies as an important part of the infrastructure for innovation networks has yet to be realised. In an education system comprising schools linked to one another in networks, in which the schools that are sources of best practice become hubs, it should be relatively simple for a school or teacher to get in touch with a peer as a source of best practice, as a centre of innovation, or as a partner – and in any area of educational concern.

ICTs potentially provide a network structure to turn 25,000 schools and their staffs into another small world in which any two nodes can connect with each other easily and quickly. Without this, transformation through transferred innovation would be too shallow and too

slow. A teacher wanting to contact a peer who might know about or be interested in a particular professional practice will succeed if the right network infrastructure is in place. Innovation networks supported by ICT provide an educational small world where every teacher is linked by a short chain to the right peer.

Of course, a teacher could simply advertise a need or interest in the *Times Educational Supplement* or on a website and hope that somebody might respond. But network tracking would almost always give a better and faster result and could have the advantage that the responding person or institution would have the pleasure of being approached through a friend's recommendation, one of the best routes into co-operation.

ICT does not, of course, make face-to-face relationships redundant: ICT complements them rather than replacing them. At the same time, we should not underestimate the capacity of innovation and best practice networks to devise solutions to problems that arise, or to borrow ideas from the Net. Take the way *Amazon.com* works, for instance. You look up a topic, and are provided with a list of books. You look up a book, and in addition to details of its content, price etc., two further resources are put at your disposal. First, you are offered reviews of the books, by the author or professional reviewers, as well as other Amazon customers. You are also told whether customers found these reviews helpful. Secondly, Amazon tells you which other books a purchaser of the target book has

also bought. Displayed before you is an elaborate set of factual information and evaluations to help you make a more informed decision about book-buying.

Epinions.com offers a similar service. It searches millions of products and services – books, movies, cars, restaurants, computers, sports, travel etc. – and tells you where to get the lowest price and which stores are most trusted by customers. Products and services are reviewed and rated by customers, and these are available to all. Customers rate reviewers for the quality of their reviews, and reviewers whose judgements are trusted by their peers are designated top reviewers. You are also told which other reviewers the top reviewers most trust. To become a top reviewer you must earn a reputation for the quality of your advice to other customers.

Will ICT really be a key to transformation? If it can provide what practitioners really want and need, it will. Hitherto, government has put on the pressure, but has not managed to match this with a balancing degree and quality of support. By engaging peer-to-peer self-organizing systems, the support mechanisms can be changed dramatically. The examples on the Internet are already there. The incredible rise of Napster is a case in point. Napster was an Internet system that allowed owners of popular music to share their MP3 collections with others. Its creator, Shawn Fanning, noticed students going to some trouble to exchange music files, so he invented the software to help them to share it easily and at no cost.

This drove the Napster epidemic: millions used Napster before it ran into legal trouble over music copyrights. In effect, Napster acted as a broker, using its database of who had which music files in order to link a request for a song from one PC to another PC that held the requisite file and was at that moment online – and then left them both alone to get on with their musical matchmaking. The system worked and prospered without need for altruism among users, who gave as a condition of receiving. Napster did not replace a centralized service with a decentralized one, but combined the two. It was the users who stored all the files, not Napster, but users had to go through Napster to locate what they wanted. Nevertheless, Napster, which folded in 2002, eroded the distinction between consumer and provider. Other peer-to-peer systems, such as Gnutella (originally designed to help folk share recipes), do not rely on any central authority to organise the network or broker transactions. Fast moving innovation in the peer-to-peer world is coming on stream just when the education service needs it.

> *What action do you think needs to be taken by whom to ensure that the new technologies support innovation networks?*

The fifth transformation – making an open source culture

Generating and sustaining networks that know how to turn ICT to their advantage is not easy, because we know too little about the dynamics of on-line communities, both in general as well as in education. The challenge of innovation demands that we change the emphasis on ICT from simple *communication* to the development of *creative communities*. As we shall see, there is a powerful model for schools seeking transformation in the on-line communities known as *open source*.

Let's start with the school. A school or practitioner who creates the knowledge behind a powerful innovation faces four options over what to do with it. They are:

• keep it to yourself;

• sell it for profit;

• share it with a partner; or

• give it away for free to anybody who wants it.

In a highly competitive climate, the pressure on a school staff is to keep successful innovations to themselves in order to maintain their competitive edge and position in the league tables to attract parents. Why give away one's best ideas? If knowledge has to be given away, because it might well leak away or be stolen, it seems sensible to sell it. One

school is said to have made over seven million pounds by selling an IT course which helped it to reach 100 per cent 5 A*-C GCSE results.

Exchanging innovations is an attractive proposition, because of the deeply embedded gift culture, by which if I give you something, you feel obliged to return something of equal value, so we both gain. Applied to schools, the gift culture could mean that the more effective schools would be inclined to exchange best practice with other above average schools, which would simply widen the gap between the best and worst schools, and thus not contribute to system transformation.

The path to system transformation requires every school to be willing to give away its innovations for free, in the hope of some return, but with no guarantee of it. Is there an example of how this might work? Yes, in the culture that underpinned the beginnings of the Internet, which started out as a peer-to-peer network of co-operating users. Its original design in the 1960s was to share computing resources between several American academic centres, each of whom acted as both server and client. In the same way, Tim Berners-Lee designed the origins of what became the Web as a way for physicists to share research data. During the Internet's commercialisation, this early symmetry was lost as huge numbers of clients came to be handled by a small number of branded servers, and many passive consumers became dependent on a few commercial producers. Today many want to restore the earlier decentralised model to enhance peer-to-peer networks and the norms of sharing in the 'hacker culture'.

Hackers are not the secretive, lone criminals who break into other people's computers with malicious intent – these are properly called 'crackers'. Rather, hackers are passionate innovators, the expert programmers and networking wizards who, through co-operation and free communication, played the pivotal role in the creation of the Internet. The overarching goal of their culture is technological excellence, because this is what determines the common need for sharing and for keeping the source code open, rather than secret, as with most proprietary software. A paramount value is freedom – to create, to appropriate whatever is available, and then to redistribute the knowledge. Each contribution to software development is posted on the Internet in the expectation of reciprocity. The inner joy of creation is a source of satisfaction, as is achieving recognition within the community of practice. Hackers have little interest in financial gain through selling their ideas. Instead, they are committed to common ownership of their collective productions.

A classic example here is Linus Torvalds, who in 1991 as a student at Helsinki University set out to create a free *operating system* (the foundation software such as Microsoft's Windows and Apple's MacOS). He involved others from the beginning by asking them for their ideas, which were then shared within the emerging network. Anybody could contribute and anybody was free to use the improved

outcomes. A new system, Linux, emerged rapidly and through collaboration developed at an astonishing rate. Many thousands of users have devoted time and energy to testing and improving Linux, so much so that it has become a threat to Microsoft's Windows – no mean achievement.

Could something similar happen in education? A key to transformation is for the teaching profession to establish innovation networks that capture the spirit and culture of hackers – the passion, the can-do, the collective sharing. Teachers could create a common pool of resources to which innovators contribute and on which any school or teacher might draw to improve professional practice. This could be a professionally self-governing means of supporting innovation with no central control. In effect, contributors to the pool would be offering their innovations and best practices as public goods in the confidence of creating an educational equivalent to the Linux phenomenon.

A hacker has been described as 'an enthusiast, an artist, a tinkerer, a problem solver, and expert' – terms that will arouse fellow feeling in every classroom teacher. The professional values and norms of teachers are close to those of the hackers: in the education service we need the practices that has allowed hackers to transform their world. The open source (or modifiable software) movement among hackers hinges on the notion that software evolves faster, works better and spreads faster as more people work on it. In a similar way, the transformation of schools needs innovation networks of teachers that can achieve transferred innovation quickly and over a far wider range of schools than ever before. And there might come a point – the tipping point – where there is the same exponential effect or geometric progression by which a Napster arises or a book becomes a best-seller or the mobile phone becomes a commonplace possession or the virus turns into an epidemic, all of which are transformations.

In short, at the heart of educational transformation are networks of communities of teachers who are passionate about transferred innovation. Like the Internet, this needs no central authority; the role of government would be to help it to flourish as a system that knows how to transfer innovation and best practice laterally and then simply gets on with job. It has been said that 'nobody owns the Internet, runs it, maintains it, or acts as a gatekeeper or regulator' – and it works. We should be able to say the same of the innovation networks in education that are the 'peer-to-peer solutions to big problems'. This path to transformation is *decentralised, distributed and disciplined*: it is an innovative way of accomplishing innovation in teaching and learning of which the profession can take ownership.

> *What action is needed to create an open source culture (i) within your school (ii) in any professional or school networks of which you are an active member?*

Epilogue

This document itself has the potential to be improved in an open source culture. You have been given this document for free, and you can help to make it better by reciprocating through your criticisms and suggestions. So if you have ideas on how it can be improved, visit www.demos.co.uk/workinglaterally. Later on-line editions will then be adjusted to take account of these points.

This document is an adapted and shorter version of *Education Epidemic*, published by Demos in June 2003.

You can download this publication at **www.standards.dfes.gov.uk/ innovation-unit** or **www.demos.co.uk/workinglaterally**

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Helping students to learn better is on everybody's agenda, and there are different views about how this transformation is best achieved. David Hargreaves argues that schools will be transformed only when teachers embrace the 'hacker ethic' – a passion for developing new practice and a readiness to share the results freely with colleagues through innovation networks.

David Hargreaves is a former professor of education at Cambridge and a former chief executive of the Qualifications and Curriculum Authority.

In 1983 he chaired an ILEA enquiry on schools which formed the basis of the national schools standards agenda. He is currently chairman of Becta and is a senior Demos associate working on the transforming public services programme.