

# TECHNOLOGY IS THE ANSWER BUT WHAT IS THE QUESTION?

**Four Basic Principles for the  
Effective Use of Information and  
Communications Technology for  
Quality Teaching, Learning and  
Effective Management**

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*Contact Nord*

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### **Four Basic Principles for the Effective Use of Information and Communications Technology for Quality Teaching, Learning and Effective Management**

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Part of Contact North/*Contact Nord*'s mandate is to facilitate ongoing contributions to the exploration and discussion of issues related to e-learning. As part of our series on online learning, we are pleased to provide the following commentary by Sir John Daniel, "TECHNOLOGY IS THE ANSWER BUT WHAT IS THE QUESTION? FOUR BASIC PRINCIPLES FOR THE EFFECTIVE USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY FOR QUALITY TEACHING, LEARNING AND EFFECTIVE MANAGEMENT". In this and future instalments of this series, we feature the reflections of a world leader in online learning.

Sir John, currently the Assistant Director General for Education, UNESCO, has a long association with Contact North/*Contact Nord*. He has been a speaker and seminar leader at various Contact North/*Contact Nord* conferences and briefings as well as visiting our Northern Ontario headquarters during his tenure as the Vice-Chancellor of the Open University of Great Britain. He's also one of the founders of Contact North/*Contact Nord* 15 years ago. I've had the personal good fortune of working with Sir John during our years at Athabasca University, Canada's Open University, where he was Vice-President, Academic.

Sir John has an innate ability to capture the essence of the issues we are all dealing with in online learning and presents them in a clear, concise and enlightened manner. His breadth of experience is quickly demonstrated in his writings and speeches. We think you will find Sir John's commentary absorbing and stimulating.

We at Contact North/*Contact Nord* believe that the world of distance education is undergoing changes of a magnitude that is sometimes hard to fully comprehend, let alone keep up with. The Internet, computers, broadband networks, and learning management systems in conjunction with advanced learning designs have created new paradigms for technology and learning. We are faced with opportunities in which technology can add tremendous value to education but we need new paradigms for learning to take full advantage of this. The issue is not whether new technologies can make a significant difference in equating distance education to 'traditional education' but how technology can enhance learning and learning environments and go beyond what we have had in any delivery mode. One of our biggest obstacles to innovation is trying to keep our old ways while adopting new technologies. As one person has commented, it's like strapping the jet engines of technology on the horse and buggy of last century's education. We can't fix new problems with old solutions.

As Northern Ontario's Distance Education & Training Network as well as Canada's Largest Distance Education Network, it is an integral part of Contact North/*Contact Nord*'s mandate to be a catalyst for discussions

on such topics. We plan to keep the issues in this particular series short, focused, and of an editorial nature. We welcome your feedback and comments.

Maxim Jean-Louis  
President - Chief Executive Officer



**Sir John Daniel currently leads UNESCO's Education Sector as Assistant Director-General for Education.**

A pioneer as well as a world expert in online learning, Sir John was the Vice-Chancellor of the Open University of Great Britain since 1990. Under his stewardship, the Open University almost doubled in size and is now one of the world's mega-universities with over 250,000 students throughout the world. He also served as President of the United States Open University since its establishment in 1998. He is one of the founders of Contact North/*Contact Nord*, Northern Ontario's Distance Education & Training Network.

Sir John holds some fifteen Honorary Doctorate Degrees from universities in ten countries including one from Athabasca University, Canada's Open University. He is a former President of Laurentian University, Vice-President, Academic of Concordia University and Vice-President, Academic at Athabasca University. H.M. Queen Elizabeth II knighted him for 'services to higher education'.

Sir John Daniel is the author of many books and articles on online learning including the seminal "*Mega-Universities & Knowledge Media, Technology Strategies for Higher Education*".



## INTRODUCTION

It is an honour to be asked to share the following comments as part of Contact North/*Contact Nord's* ongoing series of discussion papers on technology in learning. I recently raised these issues in the Raja Roy Singh Lecture I delivered at a UNESCO conference in Bangkok and also at Contact North/*Contact Nord's* Emerging Technologies 2001 Conference in Northern Ontario. In Canada and in other jurisdictions throughout the world, we are all wrestling with the same fundamental issues related to technology and learning.

For those who may not know, my roots in Canada run deep. I have held senior positions at Laurentian University in Sudbury, Concordia University in Montreal, Athabasca University in Alberta, and *Télé-Université* in Quebec.

During the past 11 years, I held the post of Vice-Chancellor of the Open University in Great Britain. Now, as Assistant Director-General for Education of UNESCO, I find that those involved in the use of technology in education spend too much time talking about the extraordinary potential of information and communication technology and too little about what they seek to achieve by using it. This gung-ho attitude is expressed in the phrase 'technology is the answer'.

My first piece of advice to you is that we must always complete the sentence. 'Technology is the answer but what was the question?' What is the question we are trying to answer or the problem we are trying to solve? Asking questions should become a habit.

My aim is to help you ask those questions. I shall suggest four principles that you should apply to thought or action that involves information and communications technology. For the rest of this lecture, I shall usually abbreviate that long expression by using the one word 'technology'. This is partly because I dislike acronyms in general and ICT in particular and partly for a reason that I shall come to in a minute. My four themes or principles all begin with the letter 'B' which may help you remember them. Two of them are ways of thinking you should

avoid and two are good principles that you should adopt. I shall go through them one by one, spending progressively longer on each.

## AVOID BIAS

My first 'B' stands for bias, which is bad. There are, of course, good ways to be biased, like having a bias in favour of the disadvantaged. Here I shall focus on the bad biases - those assumptions that can misdirect our efforts in using technology. The most prevalent of these biases is the vendor bias, which says that technology must be good for what you want to do because I can make money by selling it to you. Of course, none of you would fall for a vendor bias expressed as crudely as that. However, we must remember that the vendor bias has still got a firm grip on much of the public discourse about information and communications technology.

Fortunately, this bias has become somewhat less prevalent since the end of the dot.com frenzy but you must still be on the alert. Do you remember the dot.com frenzy that lasted from autumn 1999 to the spring of 2000? I was the head of the UK Open University at the time and the dot.com frenzy rattled me. Had it not been for the calming influence of my former colleague, Diana Laurillard, who is one of the world's clearest thinkers about learning technologies, I might have been panicked into believing that the Open University was about to become, as some dot.com critics put it, 'legacy distance education'. The word legacy carried the implication that, just like software that was due to catch the millennium bug, the Open University needed to be replaced with a brand new system.

The dot.com fanatics argued that the Internet was going to replace everything in education that had gone before and that attempts to graft the new onto the old were doomed to failure.

Today, with the information technology industry shrouded in misery, the dot.com frenzy seems long, long ago. The Open University continues to be successful by taking an evolutionary rather than a revolutionary approach to technology and I shall

refer to its experience later. Here, I simply urge you to be sceptical about assertions of the value of technology coming either from those who want to sell it to you or from their surrogates in political life. The information technology vendor community has done a remarkable job in convincing political leaders that technology is the answer to every educational problem. Sometimes our task is to be unpopular by bringing our politicians down to earth.

There is also a more insidious manifestation of vendor bias of which we must be aware. That is the suppression of research reports or evaluative studies if they undermine the thesis that technology improves everything. You have read of the row about pharmaceutical companies that prevent publication of research that they have funded if it casts doubt on the safety of their product. Vendors have funded much of the research and evaluation on the application of information technology in teaching and learning in schools. They have tended to prevent or delay publication of results that suggested technology made no difference or made things worse. We need to remember this when we read the literature. Another form of bias you often encounter in relation to technology is a prejudice in favour of private sector provision over public sector provision.

#### DETECT BULL \* \* \* \*

My second 'B' is also related to bias. It is bullshit. I have tried to find a more polite word for this but have decided to use it anyway. Bullshit is a nicely expressive word because it combines all the energy and force of a stampede of bulls with the messiness and distasteful smell of what they leave behind. This describes exactly the situation we often face in making sense of technology in education. Once an idea has currency, the press tends to stampede with it. When we see a concept everywhere, it is easy to suspend our critical faculties and assume it must be right.

For example, I was surprised by this passage in a recent issue of The Economist magazine: *'The global great and good (which I suppose means people like ourselves at this conference) are obsessed with the*

*'digital divide'. Half the people of the world, they fret, have never made a telephone call. Africa has less bandwidth than Brazil's city of Sao Paolo. How, ask dozens of inter-governmental task forces, can the poor get connected. Amid all the attention being paid to developing countries' lack of Internet access, some people feel that more fundamental problems are being ignored. Ted Turner, an American media boss, observed last year that there was no point in giving people computers when they had no electricity.'*

Such observations should make us ask ourselves questions. UNESCO too is officially committed to doing something about the digital divide. It is also interesting to note that here is a technology mogul, Ted Turner, who is pointing up some loose thinking about technology. I don't think that Ted Turner sells electricity-generating stations so this is not a case of vendor bias, simply the observation of someone with his feet on the ground.

I need not argue at length that those of us who try to apply technology to education should have good antennae for detecting BS. UNESCO is an organization for intellectual co-operation. One of our tasks is to co-operate in the exposure of hollow thinking. We encourage our member governments to engage in 'evidence-based policy making'. We ourselves should also look for the evidence when we make statements about technology.

#### THINK BROADLY

Rather than continue about the dangers of the bad 'B's, let me move to the good 'B's, which are their antidotes. My first good 'B' is breadth. By this I mean that I encourage you to think broadly about technology in teaching, learning and management. Here are two examples of what I mean. They also explain why I prefer the term technology rather than ICTs. I found the first example just the other day in a new book written entirely by women - twenty-one female contributors - called *"Using Learning Technologies: International Perspectives on Practice"*. The book contains a very telling chapter by Edith Mhehe from Tanzania. She did research to find out why so few women were taking advantage of the



opportunities offered by the Open University of Tanzania. Here is one of the replies she got:

*'When I asked about the possible use of alternative learning technologies, one woman suggested that her most pressing need was not for learning technologies but for other technologies such as washing machines, cookers and vacuum cleaners, which could help shorten the time she spent on housework and increase the time she needed for studying.'* Mhehe (2001:104)

My other example came from a seminar about education in situations of emergency, conflict and crisis that was held during UNESCO's recent General Conference. The question was how do you get children to school in a rural, mountainous region of Latin America when they live a good way away and you don't want them to arrive at school already tired out? The answer was that you get hold of some donkeys. We then heard, from both UNICEF and UNHCR, that it is actually very difficult to buy donkeys under the United Nations procurement guidelines. These require performance specifications, tendering and suchlike. In the end, someone had a flash of inspiration. The solution was to hire the donkeys as consultants, which was fine under the UN rules. In fact, the donkeys turned out to have one great advantage compared to human consultants - they did not write reports.

These are extreme examples of thinking broadly about the use of technology to help people learn. The most helpful technologies for helping Tanzanian women and the Latin American children to learn were technologies that we don't think of as learning technologies or, in the case of the donkeys, as technology at all.

So my first point is to urge you to think broadly about technology. My preferred definition of technology is simply this: *Technology is the application of scientific and other organized knowledge to practical tasks by organizations consisting of people and machines.*

Let's unpack that. First, technology is more than applied science. Non-scientific knowledge, such as crafts, design, tacit knowledge and managerial skills

are involved. Second, technology is about practical tasks, whereas science is about understanding. Third - very important - technology always involves people and their social systems. So when you use technology in education, remember that processes, approaches, rules and ways of organizing things are just as important as the devices with coloured lights and screens that we call hardware.

With that as our definition of technology, I do not need to stress that even when we talk in a more limited way about information and communications technology, we should take the broad view. ICTs mean much more than the Internet. Even in the industrialised world, let alone the developing world, only Internet fanatics and vendors claim that the Internet renders obsolete all preceding technologies: books, blackboard, film, radio, television, programmed learning and so on.

This was one of the mistakes made during the dot.com frenzy by start-up companies that assumed students wanted to do all their studying on the net. It turned out that they didn't and the start-ups either went broke or survived by adopting a broader view of what technology-assisted learning meant. Technology always involves people and their social systems. I shall come back in a minute to some of the evidence about what students want and like, but first, let's identify my second good 'B'.

## SEEK BALANCE

This is balance, which should be a particularly congenial principle in Asia where harmony and equilibrium between the yin and the yang are valued. We must strive for balance on a number of dimensions. Let's look at dimension number one. My title talks about quality teaching and learning. Teaching and learning are opposite sides of the same coin. However, it makes a difference which side of the coin you start on when using technology for instruction. Until recently, there have been two distinct traditions in the application of technology in higher education.

First, there is the American tradition, which starts with teaching and attempts to use technology to expand the range and impact of the teacher. I call this the remote classroom approach to teaching. The idea is to set up a network of classrooms and to use technology, usually video by satellite or landline, to take the teacher's lesson live to students at the remote sites. The system is interactive, meaning that students can ask questions.

Until about five years ago, this approach was what most Americans meant when they talked about distance learning. That created confusion because most of the rest of the world, including Canada, had a different tradition. The rest of the world started on the other side of the coin, with learning, and used technology to create a good learning environment for the student wherever and whenever the student wanted to study. That approach had advantages both in effectiveness and economy. Effectiveness, because by adapting the technology to the student's need, instead of the teacher's needs, one can create a powerful learning environment. Economy, because this approach can operate at scale, which the remote classroom approach cannot.

One of the great achievements of the Internet has been to end this dichotomy. The American tradition lost out because the Internet gave us a new tool to reach the student wherever and whenever. Those of you who work in this field will remember how, about four years ago, the word 'asynchronous', which had not previously been a common word in the educational vocabulary, became as American as apple pie.

So much for dimension number one. When we use technology, are we using it to enhance learning or to enhance teaching? I've made my bias clear. It is both more effective and more cost-effective to concentrate on improving access to learning, improving its quality and decreasing its cost: re-engineering, if you like, the basic triangle that defines our challenge as educators with the vectors of access, quality and cost.

Dimension number two is also implicit in my title. "ICT for Quality Teaching and Learning": yes, but for teaching and learning what? A useful distinction is

between IT for teaching and learning about computers and IT for teaching and learning about everything else. It sounds like an obvious distinction when you make it. But it is not always made and can often be the source of some of the bias and bull\*\*\*\* that I warned against. We all agree that ICTs are useful for teaching about ICTs. Heroic attempts to teach computing without computers are the exceptions that prove the rule that IT is best taught with IT. But it is a logical fallacy to extrapolate from that and assume that IT is also best for teaching and learning about everything else.

Let me give an example. It is relevant to UNESCO's key challenge of reaching the unreached and it is called the Hole in the Wall. The project is the initiative of Sugata Mitra of the National Institute for Information Technology, who is one of the liveliest minds in the IT world. Mitra had observed his five-year-old son playing with a computer and concluded that children could learn to use computers on their own with minimal help from adults. He was able to test his hypothesis by building a PC with a touch screen into the wall of a street in a Delhi slum where most children do not go to school. It quickly became known as the hole in the wall.

To quote Mitra: *'Children from 8 to 13 years old came rushing to the hole in the wall. Within an hour, they were browsing. In a week, they could do most of the common functions on a PC, cut and paste, drag and drop, copy, paste, rename and save files and so on. In a month, they were downloading and playing games from the Internet. Researchers watched with incredulity. The media exploded with stories.'* And, I would add, James Wolfensohn of the World Bank came to visit.

As a result, the experiment has expanded. Since August this year, 30 computers have been installed by the government of India in the sprawling settlements of Madangir in the south of Delhi. To quote Mitra again: *'Hundreds of children flock around them all day long. Their understanding is instinctive and incredibly accurate. They want a keyboard but we don't know how to build one that will survive in the open.'* Other computers were installed in a poor area of Uttar Pradesh where girls spend more time playing



on them than boys. From these experiments, Mitra draws two conclusions.

First, what he calls Minimally Invasive Education does exist. According to a school principal near the holes in the wall in Uttar Pradesh, the children seem to be able to learn everything on their own. Mitra's second conclusion is that because teachers are not necessary for kids to learn IT skills, it may be possible to scale up from the half million students that his Institute trains every year to the hundreds of millions that must be trained to make the digital divide a thing of the past. The question I leave with you is what do Sugata Mitra's experiments tell us about the use of ICT for teaching subjects other than IT skills to these children?

Dimension number three from my title relates to 'effective management'. Here, I merely point out that management is not the same thing as administration. A simple way of describing the difference is to say that management means doing the right thing whereas administration means doing the thing right. Computers are fast, accurate and consistent so they are a tremendous asset in administration. Indeed, you simply could not operate large distance learning systems, such as the world's open universities, without massive use of ICTs. I shall mention some applications in a minute.

The use of IT in management is more limited because the cycle of planning, implementation and evaluation that is the essence of management requires repeated human inputs and cannot be automated. However, IT is clearly helpful in providing managers with accurate and up-to-date information so that their actions can be fact based. I have also found that meetings where all participants have networked laptops are much better than conventional meetings for identifying and reviewing priorities. Because everyone can input separately in their own time, such meetings are quick and democratic.

That is all I shall say explicitly about IT and effective management. For the rest of this lecture, I return to the phenomenon of learning, which is at the heart of our endeavour. I shall argue that getting the right

balance or the right blend between different elements of learning is the key to both pedagogical and economic success when you use technology in teaching and learning.

## INDEPENDENCE AND INTERACTION

I suggest that learning is a blend of two types of activity, independent learning and interactive learning. By independent learning, I mean activities such as reading a book, working with software, listening to a lecture or an audiocassette, watching TV or writing an assignment. Such activities are a major part of any learning, especially in higher education. But most learners cannot succeed on independent activities alone. They also need interactive activities.

Interactive is one of the slippery words in the educational vocabulary. I use it to mean a situation where an action by the student evokes a response from another human being who may be a teacher, a tutor or another student. The response is tailored specifically to the student's action. Examples are a face-to-face or phone discussion with a teacher or fellow student, having a teacher comment in writing on your work, or getting an e-mail response to a query.

Good learning, in my view, requires an appropriate mix of independent and interactive activities. This distinction between these two types of activity also helps us understand how to use technology effectively from the points of view of both pedagogy and cost-effectiveness.

Concerning pedagogy, I make the simple observation that the younger the learner, the stronger the interactive component of learning needs to be. Not surprisingly, online learning is most successful in graduate programs and dropout rates at other levels can reach 80%. Handing out laptops to each infant cannot be the total solution for early childhood education.

The key issue in cost-effectiveness is that independent activities lend themselves more readily

to the use of technology and therefore to economies of scale. Print, audio and TV material and software cost relatively little to reproduce in volume once you have made the investment in the first copy. However, the interactive activities do not lend themselves to economies of scale in the same way. Making twenty extra copies of a CD-ROM costs very little, but in learning systems like open universities, another tutor is hired for every twenty additional students. This still applies if tutoring is done by e-mail or computer conference.

Put very simply, the cost curves for totally independent or totally interactive learning have very different slopes if you plot total cost against total student numbers. The challenge is to minimize the cost per student in the system by operating at scale and making maximum use of independent activities.

I expect that you are asking yourselves about the exact nature of what I call interactive activities. After all, listening to me now is what I call an independent learning activity, yet all sorts of interactions are going on in your brains at this moment as your neurons fire and compare what I am saying to your own experience. Furthermore, we often refer to today's online technologies as interactive. After all, CD-ROMs and websites respond to actions by the student.

But to what extent is this response personalized? If you make the same series of clicks that I do, will we both get the same response? Or does the program remember something about our previous interactions with it and respond to us differently? The fact is that most so-called interactive programs are not very interactive in the sense of being personalized. That's because writing fully interactive tutorial programs is labour intensive and therefore expensive.

In many applications, of course, full interactivity is not necessary. What counts is what the student finds useful. What do students find useful? How do they divide their time between independent and interactive activities and particularly between online and offline learning? Some of the most complete answers to these questions come from the UK Open

University, which I had the great privilege of leading for the last eleven years until I joined UNESCO in July of this year.

## **LESSONS FROM THE OPEN UNIVERSITY**

With 150,000 students working with it online from their homes, the Open University must be the world's largest online university. It first offered courses with online components in the late 1980s, so the novelty has worn off. We do not need to worry about Hawthorne effects. Open University students have an extensive range of online facilities available. Which ones do they use?

First, they like using the web for informational and administrative transactions. Each week, 35,000 students use a facility that allows them to check their academic record and see what grade they got in their last assignment. One student, who must have needed reassurance, used it a hundred times last year. However, only 30% of students use the facility that allows them to register online for their next course - the others seem to need some human assurance that their choice of course fits with their intended program and they like to talk to an advisor. On the other hand, the web is very popular for simple booking transactions, such as for residential sessions and degree convocations.

Online technology is also very successful where it opens up new opportunities. One is for communication between students. Each day, over 250,000 e-mail and computer conference messages fly around the Open University system. Most may not be of lasting academic significance but they greatly increase the sense of academic community. A second new opportunity is the chance to consult libraries and museums online. The University selects and updates a collection of online documents for each course and usage of this facility jumped from 60,000 in 1999 to 176,000 in 2000. Students like to go straight to relevant documents instead of taking their chances with the hit-and-miss process of using search engines.



The main conclusion I draw from observing Open University students online is that they use the technology more for activities associated with their studies rather than for the mainline work of studying course content. They make it clear, for instance, that they prefer to read books as books, not as downloaded computer files.

## STRENGTHS OF ONLINE LEARNING

I am sure that online technology will gradually play a larger role in study. To make ICTs useful, we need to design learning materials that play to their four strengths. The first is to be interactive at a sophisticated level - more than just page turning. Their second strength is as communicative media. Asynchronous group discussion is a powerful learning tool, although to be really effective it needs a human moderator. Third, ICTs can be adaptive. I mean applications where students manipulate a model, say of climate change. Having students test the impact of changing variables themselves is much more powerful than hearing a lecturer talk about it. Finally, ICTs can be productive, by which I mean that they allow us to operate at scale. The Open University has developed a technology called Stadium that allows it to hold master classes over the net to an audience of many thousands.

My conclusion is that ICTs have two key virtues. First, they support active learning experiences. Second, they support access to a wide range of media and learning opportunities. The challenge, of course, is that devising good active learning experiences is expensive because it requires lots of work by the teachers.

We need to invest more in the study of the productivity of online teaching and learning. The aim is to invest teachers' time in designing learning activities that actually increase the productivity of learning for the students. We all know how often enormous resource is devoted to designing a beautiful web application that adds little value for the student. This is another area we must strive for balance, between the effort invested by teachers and the benefit derived by students.

## CONCLUSION

There it is. I trust that my four 'B's - two bad and two good - will help you think about the effective use of ICTs for quality teaching, learning and management. I have been fortunate to spend much of my career at the heart of the development of distance learning which is the most important educational innovation of the last fifty years. In my work, I have often found useful the distinction between independent and interactive learning activities and I hope you will too.

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