Learning…..Seeing the Big Picture

The Millennium Dome was a spectacular venue for the British "Campaign for Learning" to hold its first national conference. "Creating an appetite for learning", proclaimed the Campaign's slogan, "is the key to all kinds of social, technological and economic progress."

"Please open our conference," the invitation read, "and give us 'The Big Picture'. Tell us what the slogan 'from teaching to learning' really means." It sounded like a great opportunity. Then I saw the small print. "You will be allocated half an hour for your speech". Thirty minutes to enthrall, to educate, to cajole a group of hard-pressed teachers struggling daily under the directions of what has become one of the most prescriptive education systems in the world, that it is learning, not teaching, that drives the human brain. Natural inquisitiveness is what makes the world think, I had to remind them.

It's strange, I mused below the Dome - that enigmatic icon of the new millennium - that teachers who excel in reducing complex issues to simple propositions for the benefit of their pupils are not better at telling their own story about what really matters to the general public. To explain the wonders and frustrations of human learning is to take one's audience into a tantalizing mixture of hard science and philosophic assumptions where the influences of nature and nurture are in a state of continuous flux. Thinking about learning as an abstract process can be a tortuous activity.

Humans have been using their brains to think for as long as we've been using our stomachs to digest food. Both are perfectly normal, uncomplicated processes. So what's all the fuss about? This is a good analogy but let's think a little deeper. Over the past 30 years medical science has discovered so much about the nature of the digestive system, and the chemistry of food, that on average we're living longer and far more healthily than our grandparents. We have, as it were, a better 'users' guide' to the human stomach. The same thing is starting to happen to our knowledge about the human brain. With the discovery of the bio-medical technologies of CAT and
PET scans, and functional MRI, medical science is poised to make equally spectacular
discoveries about how the brain works over the next 5 or 10 years. Whether we use these
discoveries is a matter of judgement. In a sense it is, like so much else, a political decision; does this information support what we want to see happen?

More than likely, but here we have a problem. The Media, for the past 10-15 years - encouraged by politicians and policy makers - in their frustration at the slowness of the reforms they have tried to implement, have spun a particular version of history. They suggest that the problems in schools are the direct result of the child-centered 'progressive' theories of learning advanced in the 1960s. This set of theories, such people suggest, encouraged sloppy performance and undermined discipline. Yet a careful study of the evidence would suggest that it was not the theory that was wrong, but an over-hasty implementation policy that tried to do more than teachers were then capable of doing, which was the greater part of the problem.

*When things go wrong, politicians - as with other folk - like an obvious villain to blame. It's safer than admitting that your own earlier solutions were at fault. The idea that educational reform should be led by a careful analysis of theory and research does not appeal to the English - we like to 'get on and do things' and don't have much faith in theoreticians. We want value for money, and immediately.

This is undoubtedly a major problem. We English first started to focus on educational reform in 1976 when James Callaghan made his famous speech about inviting the public into "the secret garden of the curriculum". But things didn't hot up until Keith Joseph went to the DES in 1982. They didn't start to boil until Kenneth Baker pushed through the Educational Reform Act in 1988. Education has been on the front burner ever since.

These reforms have been largely reactive; they have been led by political programmes that attract public support. They have been about doing things better; about working harder, not
necessarily smarter. They certainly have not attempted to base better policy on a better understanding of how humans learn.

This is strange because, during the past 20-25 years, there has been an immense outpouring of research from three different sources which, if taken together, fundamentally challenge the late 19th and early 20th centuries’ assumptions about how humans learn, and which are responsible for the schools we now have.

Some history is necessary. The 1944 Education Act, the Act which defined the difference between primary and secondary education, and divided secondary schools into three types, was based on a static view of intelligence and a behaviorist model of learning. This gave pride of place to instruction supported by extrinsic motivation - exams, grades, tests etc.. It took 21 years for a combination of parental and teacher dissatisfaction to show that this did not draw the best out of pupils. There was virtual all-party support for the introduction of comprehensive schools. The enthusiasm was led by a minority of very good teachers in primary schools who, on a non-doctrinaire basis of simply what worked best, formulated what came to be known later as Plowden methods. At the most it is unlikely that more than 20% of primary teachers were skilled in such progressive experiential techniques.

Politicians-in-a-hurry in the late 1960s, however, were so impressed by this work that they encouraged all primary schools to adopt child-centered, progressive teaching. With little training or advice, large numbers of teachers started to lose confidence. Their classes became rowdy and ‘standards’ started to fall. Teachers in comprehensive schools were even more unsure of themselves. Those comprehensive schools that received significant numbers of pupils from Plowden-type primary schools found the independent thinking of confident 11 year olds hard to direct. Moreover, they found the lack of intellectual rigor and discipline of those who came from primary schools unsure of what they were doing, a threat to both their academic and social well-being.
"Blame the theory, not the practice," politicians urged, always anxious to avoid any suggestion that more money, better applied, might have shown the theory in a very different light.

You see, we English have wasted long years fighting, and re-fighting, the battle between traditional and progressive education. We have sought to devise still more ways of tweaking the system, but we have been blind to the emerging evidence which could (and I believe most assuredly will) lead to a far better understanding of how humans learn. If we understood all this, I'm convinced, we would start to see endless possibilities for future growth. We don't need to fight the old fight any longer. Each was a part - an influential part - of a bigger picture. We can now, with these new insights, begin to understand the bigger issue.

And there's another story waiting to be told about a system of learning that could 'go with the grain of the brain'. Thinking about learning didn't stop in the 60s. This new story owes its origins to work being done in many disciplines, and in many different parts of the world. With it, as I said earlier, we could be in a position to have such a user's guide to the human brain that what currently we think remarkable could, in the future, be commonplace.

In the balanced prose of the US National Research Council's 1999 Report "How People Learn" it states: "until quite recently, understanding the mind - and the thinking and learning that the mind makes possible - has remained an elusive quest. In part because of a lack of powerful research tools. Today the world is in the midst of an extraordinary outpouring of scientific work on the mind and brain, on the processes of thinking and learning, on the neural processes that occur during thought and learning, and on the development of competence."
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So what is this "extraordinary outpouring of scientific work" that so far seems not to have impacted on the story about educational failure dating from the 1960s and which we hear told so often in England?

Cognitive Science in the 1970s and 80s moved far beyond the earlier simplistic stance of the Behaviorists. This was stimulated in part by an enthusiasm to understand artificial intelligence. For a while cognitive science went down a blind alley in search of similarities in the brain to a linear computer. As the science progressed, however, so the analogy of the brain as a mechanism shifted to that of an organism. This led Bob Sylwester, Professor of Education from Oregon, to exclaim, "Get rid of that damn machine model. It's wrong. The brain is a biological system, not a machine. Currently we are putting children with biologically shaped brains into machine-orientated schools. The two just don't mix. We bog the school down in a curriculum that is not biologically feasible."

The work of Howard Gardner on multiple intelligences in 1983, that of David Perkins in 1993 on the learnable nature of reflective intelligence, Bereiter's and Scardamalia's work in the same year on the development of expertise, together with all those involved in the National Research Council's Study of Human Learning, have contributed greatly in the last ten years to our understanding of learning. Gardner expressed well the ever growing disconnect between educated theory and practice when he said, "We have got to do a lot fewer things in school. The greatest enemy of understanding is coverage. As long as you are determined to cover everything you actually ensure that most kids are not going to understand. You have got to take enough time to get kids involved in something so they can think about it in lots of different ways and apply it - not just in school but at home and on the street and so on."

Cognitive scientists see learning as a process of knowledge construction, not simply knowledge recording or absorption. This we know as Constructivism. Learning is knowledge dependent, with learners using current knowledge to construct new knowledge. Yet context matters greatly. The
constructivist brain is a self-organising system that is progressively shaped by its interaction with objects and events in the world around. We actually build the structures of our brains as we use them. Thus perception is coloured by experience: we neither see nor hear something in a totally objective form, but rather our receptive processes are coloured by all those environmental stimuli that have captured our interest in the past.

It is the cognitive scientist David Perkins who describes the core of new learning theory as metacognition: "the ability to think about thinking, to be consciously aware of oneself as a problem solver, and to monitor and control one's mental processing". What marks out a good learner, Perkins argues, is the ability to question oneself, and to understand how other people perceive a problem.

So what of the implication of this for teachers? Perkins says, "Metacognitively-aware instruction attempts to transfer the critic's role from the teacher to the student." In other words, simply to advise the new teachers to become 'reflective practitioners' is only going part of the way. What is needed is for pupils to become 'reflective practitioners' also. Just knowing the content is not enough. Pupils need to understand which learning techniques work for the best in particular situations.

While cognitive science has made immense strides in its understanding of human learning in the past 20 years, it has been the development of the new bio-medical technologies of PET and CAT scans, and functional MRI, that has given a new authority to the scientific appreciation of learning. This work is new; essentially it is of the 1990s. Before that time the micro study of the brain at the level of the synapses could only be done on a dead brain. Now fully functional, normal brains can be studied as particular mental tasks are undertaken. The study of the brain has, in this way, been immensely strengthened by cognitive science's link with neurobiology. To some cognitive scientists, however, of whom John Bruer is preeminent, this is "a bridge too far".
Brue's difficulty is this. Cognitive science is single-minded in its intent - it wants to understand the learning process. Neurobiology, with all its new technologies, has opened an Aladdin's cave as scientists start to peer into the enormous complexity of the brain. So far most neurobiologists have carved out for themselves highly specific processes for study linked to isolated parts of the brain. Some say it could be decades before there are enough of these to give the factual base for an explanation of something as all-encompassing of the brain as the process of learning.

In a sense Brue is right. Unlike the claims of the phrenologists in the 19th century, we already do know that learning is not centered in any one part of the brain, no more than is memory or the ability to calculate. We also know how powerful memories are broken down into different bits - spatial bits, historical bits, emotional bits - and how these are scattered around the brain. This is important if, even with current levels of understanding, we are to appreciate how memory is influenced and recalled in different ways. Memory is stimulated by emotions, by personal connections and is, in no traditional sense, linear.

In these few short years neurobiology has become a massive field of scientific enquiry. There are in excess of 25,000 paid-up members of the American Neurological Association and it is a brave person who is prepared to make a summary of their perspective on learning. One who is prepared to draw some of this together is an English woman, Susan Greenfield, now Director of the Royal Institution but always to be remembered for the way she delivered the Royal Institution's 1994 children's lectures on the brain. Then there is Marion Diamond from Stamford, and of interest to education Gerald Edelman, the Nobel-winning neurologist from San Diego with his theory of Neural Darwinism (1993). Edelman postulated that brain growth is conditioned by the nature of environmental stimuli in ways that reflect the human immune system. As the brain grows in response to external stimuli, rather like the exuberant growth of the rain forest, maybe the best kind of classroom would be like a jungle with layer upon layer of interconnected ecosystems.
Three popular writers on neurobiology, with special interest in learning, are Bob Sylwester of Oregon, Ronald Kotulak, the Pulitzer prize-winning science writer from the Chicago Tribune with his book "Inside the Brain: Revolutionary Discoveries of how the Mind works" (1996), and William Calvin, a theoretical neurophysiologist from Seattle who published "How Brains Think: Evolving Intelligence, Then and Now" in 1996.

Calvin's book looks beyond neurobiology to the work of evolutionary biology and psychology. Let's take a time check here. Cognitive science evolved in the early 70s, becoming a vigorous and well-established discipline of its own, with its own methodology, by the early 80s. Neurobiology grew rapidly from the mid 1980s. Neither of these disciplines has yet permeated the thinking of university departments of education and even if they had, it would make little difference for, of recent years, teachers in training have had minimal exposure to learning theory, philosophy or the history of education. It was not until the early 1990s, however, that evolutionary psychology became at least a self-recognizing subject. Henry Plotkin, Professor of Psychobiology at University College London, in his 1997 book "Evolution in Mind" made the case for this new hybrid subject when he said that much of the evolution of Homo Sapiens over the past 2 or 3 million years has centered specifically on the evolution of the brain and the transformation of behavior. Plotkin noted that, for the better part of 150 years, psychology has consistently ignored evolutionary theory, but this is all starting to change. "The nature-nurture question is where all the action is, or should be, all the time. It's the only conceptual game in town - the only way to understand why the human mind is what it is."

Many prolific writers and researchers obviously agree, for the study of evolution on human behavior - specifically on the brain and learning - consumes much public attention. But not the support of the other two front runners: cognitive science and neurobiology. Evolutionary studies are, by their very nature, speculative, long-term, and draw heavily on inferences from other subjects as diverse as archaeology and cultural anthropology. They require a methodology of a kind totally alien to cognitive science and neurobiology. Yet, to the student of human learning,
each of these disciplines contributes valuable, if different, ways of understanding human potential. Intelligence is an interesting illustration of a dilemma. So far, neurobiology has no explanation for intelligence, but cognitive science - using a very different set of research tools - has evolved theories of intelligence that we accept as extremely interesting hypotheses, even if we can't, as yet, see this in the "trembling web" of our dendrites. Evolutionary studies, drawing on archaeology and cultural anthropology, can tell us much about how man's intellectual skills have developed over time.

Neurobiology does, as it were, give us a fascinating and increasingly precise snapshot of the brain as it is now. By itself it cannot explain - at least, not yet - many facets of human behavior such as intelligence, creativity and the deepest of all questions, man's continuous search for meaning. For part of this, the perspective of cognitive science is helpful. But neither of these, singly or together, explains how the brain has evolved to meet ever-changing challenges over millions of years. For this we need the additional perspective of the evolutionary subjects. As the Harvard Business Review said in an article on evolutionary psychology in 1998, "You can take man out of the Stone Age, but you can't take the Stone Age out of man." Evolution moves very slowly; on that time scale 30,000 years is a very short time.

Independent of cognitive science, neurobiology and evolutionary studies is the emerging interest in Complexity, another study essentially of the past decade. Students of complexity argue that Systems Theory provides a powerful insight into the brain as a learning instrument. Learning is dynamic and the brain, so Stuart Kauffman argues, is attracted to areas of uncertainty because that is where new ideas are formulated. "The brain likes an intellectual challenge in ways similar to an athlete contemplating a race track. If the dynamics of the system are too chaotic, no learning occurs because there is not enough stability to conserve information; if the dynamics are too static, no learning occurs because no change occurs in response to "new information". Learning occurs on the border of order and chaos. A good teacher has to be prepared to let his students live dangerously if they are to profit from experience.
Writing in "The Chaos Network" in 1994 John Cleveland noted "[the human] capacity for self-reflective thought and the ability to encode information in symbol systems, such as language and writing, frees us from dependence on our genetic past as the sole source of generation to generation information transfer." All this is made possible, Cleveland says, "by the physical construction of the brain as a non-linear, self-organizing system.... The integration of constructivist learning theory, knowledge of learning styles and knowledge of brain physiology create an emergent set of practices that look much more like what we might design if we set out to create a 'brain compatible learning environment poised 'on the edge of chaos'; open inquiry-based constructivist learning; cooperative learning; integrated theoretic instruction; authentic assessment; and community-based learning.....[such institutions would have] enough stability to conserve information and learn from experience, and enough dynamic instability to continuously grow and evolve." The language is very different, but isn't that just about what the experiential, progressive teachers of the 60s' primary classroom understood?

By studying the recent research in cognitive science, neurobiology and evolutionary studies we can see the emerging circumstantial evidence for dynamic learning environments that both honor old knowledge and facilitate the growth of new ideas.

Here we must return to the popular history of educational theory. We really do have to challenge its accuracy. What Sir Richard Livingstone, the eminent classicist and President of Corpus Christi, Oxford, said in 1941 on the basis of intelligent intuition [see inset] has been reinforced, 60 years later, by the clinical studies of Howard Gardner as a psychologist, and made still clearer by work on Constructivism by cognitive scientists, some branches of neurobiology, as well as by systems theory. It was not child-centered education as understood in the 60s that was proved wrong by the experiences of the 70s and 80s, but the unintelligent, unthoughtful expansion of such a system far too fast, and with far too little preparation of the teachers and the parents, that did so much damage to its credibility.
What the innovators of the 60s, 70s and 80s - and even of the 1990s - did not really appreciate was that these new understandings about human learning could not be easily bolted onto the present structures of schooling. For 30 years and more, well-meaning educators have sought to respond to each new government initiative - be it computers, vocational education, P.S.E., civics, literacy and numeracy hours and the like, by adding something more to the present curriculum. It is not surprising that we now see a teaching profession ground down by the weight of prescription, desperately trying not to miss out on new ideas by forever expanding its curriculum. And we see overworked but under-inspired pupils.

John Cleveland puts it most succinctly: "Most school reform has failed because it attempts to mandate new structures without changing the important rules in the system, especially our theories about how people learn. New learning theory and practice constitute fundamentally new rules governing the interactions between players and the education system. As the rules spread throughout the system, we should expect to see old structures break up and new ones form. This means we should [look forward] to an extensive period of turbulence in education. In fact our practical experience has been that educators are intuitively attracted to 'edge of chaos' learning theory and practice, but shrink back from it when they realise that letting it spread will create high levels of disequilibrium and likely result in massive structural changes throughout the system."

That is exactly what started to happen in the early 1970s in England as bright-eyed, bushy-tailed 11 years olds, who believed in themselves as learners, hit the sterility of the secondary school. Secondary education then, and now, was unnerved by youngsters who needed more than just instruction. It was the children who suffered, and the institutions that remained unmoved.
That is why The 21st Century Learning Initiative claims that what we have in English education, and over much of the western world, is an education system that is largely 'upside down and inside out'.

'Upside down' because we continue to assume that the learning of older pupils is more significant (and therefore more worthy of generous funding) than the education of the youngest child. Class sizes for 5, 6 or 7 year olds should be much smaller than for 16, 17 or 18 year olds. It's 'inside out' because over the past 20 years we've mistaken a crisis in learning for a failure in schooling rather than what it is much more obviously seen now to be a crisis in childhood, even a crisis in community.

The answer to our present dilemma is all around us. If we follow through our often-quoted belief in 'lifelong learning' we even have the new organizing principle for schooling. Lifelong learning does not start after formal education has been completed. Formal education is preparation for lifelong learning. Instead of making pupils ever more dependent on teachers for instruction as they get older, education in the future should do the exact opposite. When children are very young, during the first 6, 7 or 8 years of life, when evolution has equipped them to learn quickly in an apprentice/mentor role, class sizes should be reduced. To illustrate, a class of 10 at the age of 5, 12 at the age of 6, and 14 at the age of 7. A pedagogy needs to be developed that so builds up this ability to practice more sophisticated skills, that as the child grows he needs less direct instruction and is held more responsible for his on-going improvement. As young people experience the hormonal urges of adolescence both to take control of themselves and to live 'on the edge of chaos', the school system should capitalize on this by giving them more, not fewer, opportunities to do things for themselves. For this they should be held fully accountable: growing up requires being tough, thoughtful and creative. We should require this of teenagers, both for their wellbeing and our own.
"Now I get it," a Canadian once said to me. "If this were to happen, it would be the children who would be tired at the end of term, not the teachers!"

Isn't that what it ought to be?

It certainly could be. But only when teachers have the confidence and the expertise to retell history as it really was. You see, the argument that the Initiative advances is not the same as the progressive movement of the 1960s, although it does share a belief in the importance of experiential learning as a component of Constructivism. In England, in particular, great care has to be taken to ensure that people do not interpret all this through a "we've tried all this before and it failed" lens.

Without correcting their perception of what actually happened in the past, the general public however you perceive it - be it politicians, administrators, policy makers, or the great 'chattering classes' - just won't know what to make of such diverse findings from psychology, cognitive science, neurobiology, evolutionary studies, systems theory and the like, as I have tentatively set out.

To those who don't correctly understand history, clues to the future are largely meaningless.

So who is going to do this? Members of the Campaign for Learning are in as good a place to start as anyone. For remember this: there aren't any great people out there anymore, there's only us. In fact there never were! People only become great once they feel impelled by the courage of their convictions to actually do something that will make a difference. Daunting as that sounds, I don't think we have any option. As an American colleague said recently, "Knowing what we know now, I don't see that we have the moral right to continue doing what we once did."

That's the Big Picture.