The John Eggleston Memorial Lecture, DATA 2005 Design and Technology for the Conceptual Age

Patricia Hutchinson, Ph.D, College of New Jersey, USA

Abstract

Twenty years ago I spent a year studying the Design Process in CDT in the UK on a Fulbright Scholarship. Pre-National Curriculum, it was an exciting time to be a technology educator. Among the people whose work had impressed me in my doctoral research were Bruce Archer, Ken Baynes and John Eggleston. It is on Professor Eggleston's influence on American technology education that I attempted to focus for this lecture.

John Eggleston was responsible for many of the values that underpin our conception of Design and Technology in both the US and the UK. His ideas are among the most humanizing principles underlying our conception of design and technology as a new school subject for all students. Recently in the US, however, technology education has begun to take engineering as its professional model, a considerably narrower view of our enterprise than some of us have envisioned. There are many reasons for this, political, cultural and economic. The most significant may be a result of an expected shortfall of engineers, since tightened national security has limited the number of foreign engineering students who have traditionally studied and then stayed to work in the US. This influence tends to shift technology education from general education to a pre-professional or pre-vocational offering.

During the 1990s, many of us in technology education based our view of the field on a continuum of designerly activity ranging from the artistic to the scientific. A recent book by Daniel Pink, titled *A Whole New Mind*, supports the view that the skills most valuable for the highly technological future, in both careers and life in general, may not be those left-brained skills associated with engineering, but rather the more right-brained capabilities typical of the designer.

The left-brain/right-brain juxtaposition is a key component of Pink's argument. He points out that information technology is replacing or at least devaluing the logical, analytical capabilities of the left brain, much as mechanical devices devalued human strength and dexterity and took us into the industrial age. Pink feels we are now moving beyond the information age and into the conceptual age, where creativity and empathy will be the critical factors in success of all kinds. He identifies six "senses" that will be of major importance in business, healthcare, law, economics and other key enterprises and provides strategies for assessing and strengthening these senses. Many of the activities he suggests would be familiar to design and technology teachers.

The whole new mind that Pink describes is highly consistent with the broad definition of technology education articulated by John Eggleston. Pink's observations suggest that the left brain-directed abilities that currently characterize engineering are only part of the picture of the technological literacy and capability; hopefully, a more holistic version of technology education will lead the way into the Conceptual Age.

Key words

John Eggleston, design and technology, technology education, engineering design, design education, conceptual age

Design And Technology For The Conceptual Age

Twenty years ago this summer, I was preparing for a life-changing experience: spending a year in England studying the design process as envisioned in CDT. This study was the core of my doctoral dissertation, a project I'd undertaken at New York University under the direction of Ron Todd. The opportunity to study CDT first hand was underwritten by the US-UK Fulbright Program, and from that year sprang many friendships that I still count among my most cherished. I learned some things about design and technology too, not to mention language, humor, economics, food and plumbing.

RESEARCH

The John Eggleston Memorial Lecture, DATA 2005
Design and Technology for the Conceptual Age

As preparation for my stay in England, I had been reading everything I could get my hands on, and the three major experts I had identified prior to my visit were named Bruce Archer, Ken Baynes and John Eggleston. Meeting the three of them topped my list of priorities for the year. I succeeded in interviewing Professor Archer, managed to say hello to John Eggleston at a conference, and Ken Baynes must have heard that someone was hot on his heals, because each time I got in his vicinity, I found he had left five minutes before. So, in the tradition of the best made plans of mice and graduate students, I learned to adapt to the situation.

And what a great situation it was. Pre-National Curriculum, I found myself in a place that seemed to be sizzling with creativity and a sense of possibilities. With the help of David Perry, whom I'd met at NYU during his own recent study tour to the US, I started creating a network that eventually included dozens of amazing classroom teachers, along with such young luminaries as Richard Kimbell, David Barlex, John Cave, Richard Tufnell, Peter Sellwood and many others – the "reflective practitioners" of an emerging discipline. (I'd just read Donald Schon in grad school.)

The rationale for my UK study was a kind of "technology transfer." I'd made a case that something valuable was happening here, and that we in the US might be able to learn a few things from our British cousins that would benefit our own effort to establish technology education. The technology in question was an approach to learning that would better prepare our graduates for the realities of 21st century life than anything currently available in the school curriculum.

When Richard Green and Eddie Norman invited me to deliver the 2005 Eggleston Memorial Lecture, I set out to write about how I thought John's ideas had influenced our work in the US. To do that, I had to go back into his books and articles and talk to people who knew John first hand. I also polled some of my colleagues in the US, and in truth, I didn't find a great many people in technology education in the US who were well acquainted with John or his writings. But I feel that his ideas and opinions are so basic to design and technology that no one in the US associated with the subject has been untouched by them.

As a sociologist, John wrote about many subjects. But particularly important to technology educators is John's vision of design/technology as a strategy for delivering important societal goals. John saw:

- technological literacy as the key factor in quality of life and range of opportunity for citizens;
- design as central to technology;
- design/technology as general education which provides tools for inquiry useful throughout life;
- the intellectual and practical benefit of work with materials;
- the importance of design/technology for all students, girls and boys;
- distinctive processes, content and decision-making capabilities developed uniquely by design/technology;
- the need for first hand knowledge, where most of what we know today comes second-hand from TV, film and video; computer games; and simulations;
- the vision of design/technology as citizenship education.

Virtually all of the above have been incorporated into the US vision of technology education. But there are also a few major ideas that have not seriously impacted the US scene, such as:

- the unification of "male" and "female" technologies and materials into one field of study; and
- the recognition of drawing and modeling as alternative, designerly modes of communication and self-expression.

I hope they someday will. In fact I'm seriously concerned that some of the most liberalizing elements of our vision of design and technology may be at risk, just at the point when we may need them most. I think John

Eggleston's holistic view of education is the one we need to cultivate and build upon.

Core subjects in the school curriculum are meant to prepare us for life in general, regardless of our eventual career choices. All subjects, however, have a professional model from which they take their process or method, and parents, particularly, tend to hope that a subject at which a child excels might eventually lead to a satisfying career. The career models of most core subjects are familiar – everyone knows what a scientist does; can imagine a professional mathematician (an accountant or a statistician); and picture being a newspaper reporter or novelist.

Technology in the US is still trying to find its professional model. During the 1980s, the role of design in the emerging vision of technology education was broader than it is today. Some of us advanced the idea of a technological continuum (Figure 1) extending from art and design to engineering science.

People who had never thought of themselves as technologists began to consider themselves in that role. After all, they designed solutions to problems; processed materials, energy and information; and took action in the home, community and workplace with an eye to making improvements in the physical world.

But for a number of reasons, the landscape has changed. The shift was heralded by the *Standards for Technological Literacy* published in 2000. There, design is acknowledged as the process of technology, but it is engineering design about which students need to gain knowledge and skills. Many have embraced this idea – and heaved a sigh of relief that finally that fuzzy, semi-mystical, perhaps almost even "*feminine*" perspective represented by designers is in retreat. But for others of us, the engineering model leaves much to be desired.

Consider the popular vision of an engineer. To most Americans, an engineer is a man. He is of Caucasian, far eastern or Indian heritage. He is good at science and math; he's analytical; he uses computers and other such tools to work out technical problems behind the bewilderingly complicated devices and systems of the modern world. He is a policy implementer rather than a policy maker. He is not known for his sparkling repartée, sense of humor or snappy wardrobe. Even if this is unfair to individual engineers, the impression is ubiquitous.

To many in technology education, any shortcomings in this personality profile are offset by the notion that engineers are smart – just look at their SAT scores, especially in math. They are resourceful, technically competent, and respected. They are the no-nonsense professionals who form the backbone of our western economies, and the chief impediment to progress in the modern world is the fact that there aren't more of them. Rubbing elbows with this group is a leap in status from the previous model of the mechanic, tool and die maker, machinist, printing press operator or other kind of technician in dirty coveralls or shop coat with whom their field was previously associated.

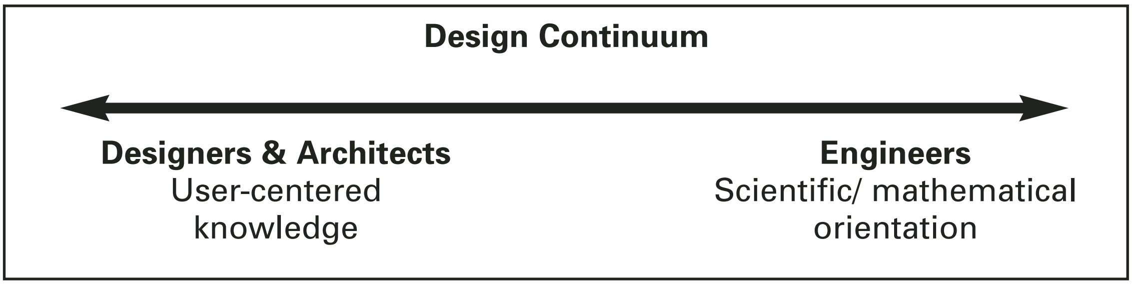

Figure 1: Design continuum

The John Eggleston Memorial Lecture, DATA 2005
Design and Technology for the Conceptual Age

One reason for the ascendance of the engineering model in the US is pragmatic, and it has to do with a perceived threat, much like the emphasis on science after the launch of Sputnik in the '60s. Since 9/11, foreign engineering students have had a much harder time getting into the US to study engineering (Levy, 2004). A large number of foreign graduates used to stay and work in the US, and without them, there is a serious shortfall of engineers for industry. To encourage more US youngsters to enter engineering, the National Science Foundation (NSF) and professional societies are taking an unprecedented interest in the pre-college pipeline, and are expanding their support of school math and science to include technology/engineering education. The view of technology education they support, however, is narrower and less inclusive than what many of us envisioned even a decade ago. At a recent conference called SEEK-16 (Strategies for Engineering Education K-16), I asked the engineering professors in my work group whether they saw technology and engineering as synonymous. Oh no, they said; technology is broader. You do technology in elementary school to show kids how exciting math and science can be. By high school, technology education should be synonymous with pre-engineering. And following a model introduced in the US by a well-funded corporate initiative called Project Lead the Way™, it should be available only to students who excel in calculus and physics.

The retreating footsteps you hear are the sounds of all those 1990s graphic artists, chefs, dentists, architects, landscape designers, cinematographers and parents-who-create-neighborhood-playgrounds leaving the room. We thought there for a minute ***we*** were technologists and were ready to demand technology education for our daughters and sons. Guess we were wrong.

American engineering educators do know that their programs have an image problem and that it hampers recruitment to and retention in the field (Farrell, 2002), so the best engineering schools are trying to change their programs. Engineering deans have often bragged about the low survival rate of their first-year programs. One of the biggest innovations is a shift from weeding out the inadequate 50% of freshmen (death by calculus) to trying to retain as many of the qualified entrants as possible through mentoring and coaching. Inclusion of more liberal arts courses, previously viewed as irrelevant, is on the rise, including sociology, ethics and environmental studies. Many programs are seriously recruiting women, and even taking unprecedented steps to keep them once they get them (Goodman Research Group, 2002).

As I said, this is happening at the best engineering schools. Much more common, I think, is the view that engineering is, actually, all about solving problems with math and science, and the traditional university programs are fine. The public school system simply needs to produce more students who are better at both subjects. Which means that technology education, if it claims to provide kids with experiences in engineering design, should be more like college engineering.

A few years ago, some of us, including Richard Kimbell and Kay Stables, worked on a trans-Atlantic proposal to NSF for a Center for Design, Engineering and Technology. One of the consultants to the project was an engineer from the University of Georgia, Dr. David Gattie, who talked about what it might mean to make technology education more like engineering (Figure 2).

Dr. Gattie listed specific scientific principles and mathematical tools (Figure 3) that any technology student should understand and be able to use.

I think all of the people at the meeting welcomed these ideas and felt that strengthening students' understanding and ability to apply math and science would truly make their designing stronger. Dr. Gattie recognized as equally important the social impacts of design and the need to educate

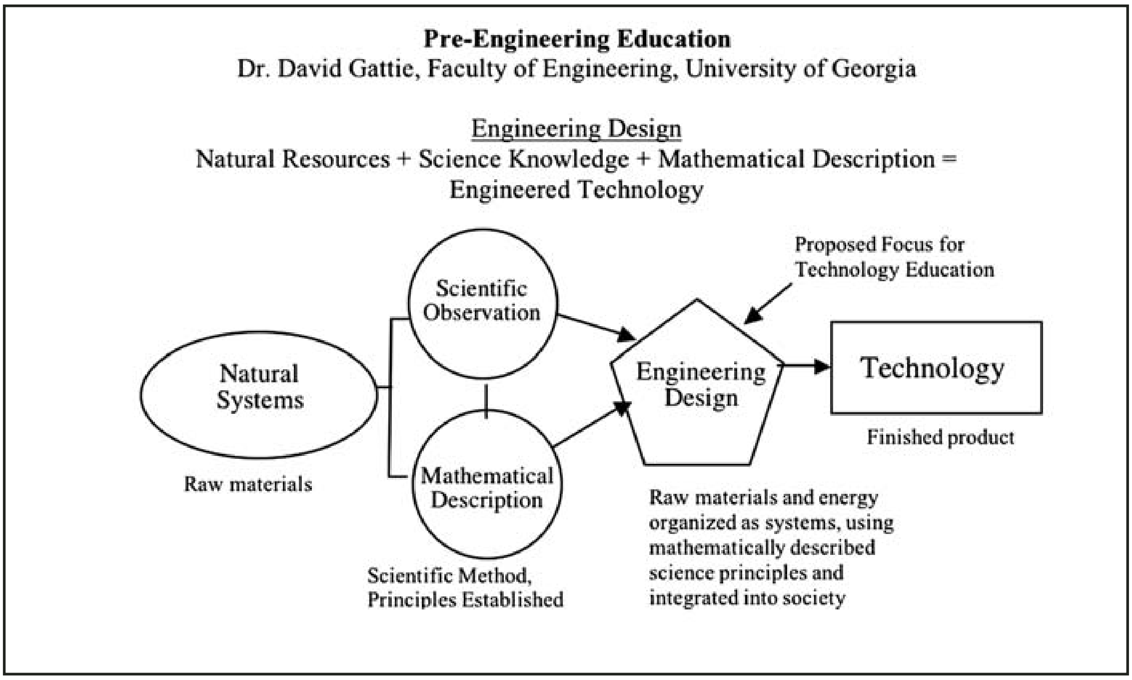

Figure 2: Pre-engineering education

Scientific Principles with Mathematical Description

• Forces and matter	• $F = mA$
• Buoyancy	• $\rho_1 g v_1 = \rho_2 g v_2$
• Pressure	• $P = F/A$
• Thermodynamics	• $Pv = nRT$
• Chemical kinetics	• $d/dt\, w(t) = k1w(t)$
• Cellular growth	• $N = N_0 e^{-kt}$
• Light	• $E = mc^2$

Figure 3: Scientific principles with mathematical description

students in this aspect of engineering. His vision of engineering was one we could live with. David Gattie is an environmental engineer, however, and had to admit that some of the social, aesthetic and environmental concerns he expressed might not be shared by people from other engineering fields.

Our proposal, by the way, was not successful, despite strong support from generalists in our field. In fact, no grant was awarded in 2003 for technology education. A center was established the following year through NSF funding, called the Center for Engineering and Technology Education (NCETE). Its goal will be to "strengthen the nation's capacity to deliver effective engineering and technology education in the K-12 schools." (Hailey et al.)

Over the past year, I've become increasingly concerned about the direction that technology education is taking in the US. The message is that engineering design is the only kind of design we practice. Contextual problems are valuable, but the range of appropriate contexts is narrow. Working with materials is good, but some materials are more acceptable than others. Creativity is not an important value.

A few months ago, I heard an author on National Public Radio and subsequently bought his book, *A Whole New Mind*. In the tradition of *Megatrends* and *Future Shock*, the author, Daniel Pink, presented his analysis of the present and projections about the likely future of life on Planet Earth. The book might have been subtitled: *The Rise of the Right Brain.* Much of what he said resonated with me, and I'd like to share some of his observations with you.

Most of us know the theory that the two hemispheres of the brain are specialized (see Figure 4), though in normal people they work together. There's considerable research behind this theory, bolstered by new imaging technologies. Much of what traditionally happens in schools addresses the left hemisphere's abilities, but Pink thinks that we are entering a new age in which the right side of the brain will come into its own.

Specific kinds of abilities have allowed certain people to prosper throughout history.

By way of parable, Pink tells the story of John Henry, a former slave who labored drilling railroad tunnels in the years following our Civil War. Reputedly the strongest man of his day, John Henry was beaten by a steam-powered drill in a tunneling competition, and with him died the age of the primacy of physical strength.

A century and a quarter later, Garry Kasparov, the chess champion, yielded his crown to the computer Deep Blue in a widely hyped chess match, signaling the triumph of the computer over human left brain functions.

Brain Hemisphere Specialties

Left Brain Directed Thinking	**Right Brain Directed Thinking**
Sequential	Simultaneous
Specializes in facts	Specializes in context
Analyzes	Sees the big picture
Right side of body	Left side of body

Figure 4: Brain hemisphere specialties

When schools geared up to prepare the citizen/workers for the world of industry, they focused on facts, logic and procedural knowledge, the talents of the left brain. And it worked. Each generation became better off and found more time for innovation. That's progress. The inventions thus fostered brought us the information age, and allowed people who work well with information to use these tools to prosper – at least for a while.

Just as mechanical devices didn't immediately replace most unskilled labor, so the computers of 1990, Deep Blue's era, were not ready to take over the majority of information processing jobs of their day. But with every advance in information technology, the need for people to spend time on sequential, analytical and computational tasks has been reduced.

Pink observes that the abundance our countries now enjoy, arrived at by left brain-directed skills, has moved us to a new era in which our needs are met, and in many cases more than met. Almost everything we once did with bodily labor and left brain thinking can now be done more economically by machines or outsourced to sharp, skilled workers far away. Already much of the traditional work of doctors, accountants, lawyers and engineers – matching treatments to symptoms, tracking debits and credits, searching for legal precedents, and analyzing test data – can be done by less expensive technical experts in India. What's left are the intuitive, holistic, empathetic aspects of these fields, the ones that have always distinguished the truly gifted professionals from the merely adequate ones. And the trend will only continue. We have entered the conceptual age, and the people who will flourish will be good at the kinds of things machines *can't* do.

In the July 11 issue of *Time Magazine*, an article on outsourcing predicts that as many as 52% of engineering jobs could be moved offshore (p. 22). What does this say about the future of engineering, or its role as the model for technology education?

The work of the conceptual age that Pink describes will call for creativity and empathy, which he calls High Concept and High Touch. While there's a flavor of New Ageiness to these terms with which I'm not totally comfortable, I like his argument.

Thinking at a high conceptual level involves being able "to create artistic and emotional beauty; detect patterns and opportunities; craft a satisfying narrative; and combine seemingly unrelated ideas into a novel invention" (p.2) Operating with a high degree of touch requires being able to detect subtle signals in human interaction and to empathize, as well as having a sense of humor and of a larger purpose – a kind of holistic world-view. Pink feels these right-brain directed qualities are fully applicable to the work world of the 21st century, and that they can be cultivated using six *senses*. Many of these are exactly the qualities that are exercised in good design and technology education, though not necessarily in the pre-engineering curriculum.

In fact, the first of these Pink calls a *sense of Design*, by which he means creating new products, services, experiences and lifestyles that have both utility and significance, that are not merely functional, but that are also "beautiful, whimsical or emotionally engaging" (p. 79, cited in Bouchenaire 2003).

The product pictured below fulfills that need for both utility and significance. The smile says it all.

Figure 5: '76 Triumph Bonneville motorcycle and satisfied customer

RESEARCH

Pink provides lots of examples, such as the comment from GM's design director, Anne Asenio, that, "For a long time, going back to the 1960s, marketing directors were focused on science and engineering, gathering data and crunching numbers, and they neglected the other side of the brain, the right side" (p. 79, cited in Bouchenaire 2003). Now GM declares they are in the art business, and have elevated designers to the level of engineers in the corporate structure.

Meanwhile, healthcare systems are discovering the value of light, color and texture to patients in hospital rooms, as indicated by decreased requests for pain medications and lower drug costs than for patients in traditional rooms. Similarly, a study of Washington DC schools found that "improving a school's physical environment could increase test score by as much as 11 percent" (p. 82, cited in The Value of Good Design, 2001).

To help readers start the process of engaging the right brain, Pink offers many of the kinds of exercises design teachers have always used. One example is:

- Keep a design notebook – or even a small digital camera – and record really good designs. Analyze where the "significance" lies in these objects.

A second capability is the *sense of Story*, which means being able to move beyond, data, facts, or an effective argument. Being able to fashion a compelling narrative.

- Do you remember who John Henry was?
- Can you list the four functions of the left side of the brain?

You probably did better with the first question than the second. The difference between facts and stories was famously illustrated by E. M. Forster:

> A fact is: The queen died and the king died.
> A story is: The queen died and the king died of a broken heart. (p. 101)

History taught through a succession of dates and facts is hard to remember. History taught through historical novels is hard to forget. Stories make an emotional connection. Schools need to understand this, and history at least lends itself to a story line. Now try applying the idea to science and math.

Daniel Pink says that the art of story telling is of growing importance to many businesses. You may not be aware that several of your most respected actors and directors now advise large companies on using story to improve their business operations. From the sale of real estate to cars to wine, a good story can provide the context that differentiates two products.

Meanwhile, in the world of managed health care, patients tend to be treated like a compilation of the facts surrounding their illnesses. This does little for their outlook, which can directly impact their recovery. Pink notes that some of the best medical schools are now giving their students courses in story-listening and story-telling, called narrative medicine.

To cultivate your sense of story, he suggests:

- Write a mini-saga in exactly fifty words. It must be compelling and have a beginning, middle and end.

The next sense is the *sense of Symphony*, by which Pink means synthesizing the whole picture from disparate parts. Computers are good at diagramming sentences and creating an outline from the full text, but not at putting pieces together to form a new entity.

The right side of the brain controls pattern recognition, the first step in synthesis. Thinking in metaphors is one example of pattern recognition. Other abilities of the right brain support symphony. It works happily on several things at once. It tolerates ambiguity nicely. It sees situations holistically.

According to Csikszentmihalyi (1996), creative synthesizers typically do not match gender stereotypes. Creative girls are often strong-willed and creative boys are often sensitive; this suggests an androgynous quality to creativity.

Pink notes that self-made millionaires usually think holistically. They are also much more likely to be dyslexic than the average person, and often have been poor students. Their problems with perceiving and analyzing details may cause them to compensate by learning to see the big picture, an ability that serves them well as entrepreneurs.

To strengthen your capacity for taking the holistic view, try going non-verbal by:

- Drawing, especially using some of Betty Edwards' techniques. A favorite is the challenge of copying a line drawing viewed upside down (see Figure 6), which allows you to see relationships rather than drawing specific named parts.

Figure 6: (Adapted from Betti and Teal, 1980)

The next sense is the *sense of Empathy*, which is the ability to understand what makes another "tick" and to forge relationships that you care about.

Experiments from Darwin to the current expert, Paul Ekman, have shown that faces around the world reflect emotion in the same ways. Pink notes that interpreting expressions is a non-verbal, right-brain directed activity, and might come more naturally to women than men. He cites research at the University of Sussex that found that the majority of women cradle babies on their left side, the side controlled by the right side of the brain, the better to understand their wants and needs, which are expressed non-verbally.

Businesses, continually try to replace people with computers. But voice recognition systems designed to let you make travel plans or doctor's appointments lead to frustration the moment you deviate from the scripted choices, and the successful businesses promptly routed you to an empathetic human being.

To assess your sense of Empathy, see how well you can judge emotions from facial expressions (see Figure 7, below).

Which Smile is Real?

Figure 7: Which smile is real?

If you thought that was easy, take the "Spot the Fake Smile" test from the BBC at www.tinyurl.com/2u7sh

A man asks his neighbor,
"Will you be using your lawnmower this afternoon?"
The neighbor replies "Yes, sorry."
The man exclaims: "Great! Since you'll be busy, can I use your golf clubs?"

The fifth sense, the *sense of Play*, is characterized by enjoyment of games; lightheartedness; sense of humor.

Henry Ford was known to fire workers who smiled on the job, consistent with his belief that work and play don't mix. Today, most young people fully expect to have at least some fun at work.

RESEARCH

Many of them have grown up playing video games, and gaming engages the right hemisphere of the brain through non-linear thinking, problem-solving and self exploration. Entertainment is big business in a world of abundance.

A popular degree at Carnegie Mellon University in Pittsburgh is a master's in entertainment technology, offered as an interdisciplinary program of the art and computer science departments.

The Harvard business review has been giving attention to humor in the workplace. Their report: "Humor, used skillfully… reduces hostility, deflects criticism, relieves tension, improves morale, and helps communicate difficult messages" p. 190, cited in Sala 2003). Meanwhile, in India (where your X-rays are being read), a new form of yoga called laughter yoga is sweeping the country.

To cultivate your students' sense of humor:

- Remove captions from New Yorker cartoons and have your students try writing their own.

The final sense necessary to prosper in the Conceptual Age is the *sense of Meaning*. Pink says that, in a world of material plenty, taking interest in a larger pattern into which our efforts fit is a key ability for achieving happiness.

Most people in the developed world have been relieved from true suffering. We have the luxury of time to devote to things beyond our own material pleasure, which is the most likely route to a sense of meaning. Having a sense of meaning is our ultimate happiness, a sentiment echoed from Maslow to the Dalai Lama.

For many people, meditation and contemplation are important routes to finding meaning in life, and increasingly, companies are providing yoga and Tai Chi sessions for employees. Corporate structures that reflect this philosophy may be well positioned to address the consumer desires of the future.

The free flowing, non-verbal nature of meditation is right brain activity. To tap this sense, try:

- Tai chi, yoga, or walking labyrinths, which are easier to find in the UK than the US. Good places to try are **www.labyrinthos.net** and **www.labyrinthsociety.org**

The "Whole New Mind" that Pink describes balances left-brain and right-brain-directed thinking in order to address the needs and opportunities of the post-information age world. And to a certain extent, the engineering profession recognizes the need for some of these qualities as well. The authors of a recent publication of the National Academy of Engineering, *The Engineer of 2020: Visions of Engineering in the New Century*, state "the creativity requisite for engineering will change only in the sense that the problems to be solved may require synthesis of a broader range of interdisciplinary knowledge." They further comment that "as always, good engineering will require good communication… enabled by an ability to listen effectively" and "to communicate with other engineers and the public." (p.55)

The book concedes few shortcomings of modern engineering; it merely projects the need to continue to change with the times, since "both social and political acumen (will be required) to navigate changing world conditions" (p. 59). This is good advice for the engineering profession, but that profession alone will still be an inadequate model for the citizen technologist.

Technology education will continue to need to address the entire practical design curriculum if the goal is to prepare all students to grapple with the complex and integrated issues of the modern world. Far more than being the place where math and science are finally made relevant, technology classes need to reflect the larger designed world and demonstrate how to draw on all of our knowledge, skills and attitudes to solve problems. And if, at advanced levels, a pre-professional mission is truly the future of technology education, this may mean tracks modeled not only on engineering, but also on architecture, product and communication systems design, chemical and biotechnologies, and other professions as they emerge.

The John Eggleston Memorial Lecture, DATA 2005
Design and Technology for the Conceptual Age

The western world has a long history of developing left brain abilities, but little experience in cultivating the right brain. Those right-brain directed senses are not being cultivated in schools, except by educators who value the role of designers, in the broadest terms, in the technological world. Engineering skills are only part of the picture; hopefully, a more holistic version of technology education will lead the way into the Conceptual Age.

hutchinp@tcnj.edu

Bibliography

Betti, C. and Teal, S., (1980) *Quick contour. Drawing: A contemporary approach*. New York: Holt, Rinehart, Winston, p.115.

Farrell, E.F., (2002) Engineering a warmer welcome for female students. *The chronicle of higher education*. 48, A31.

Goodman Research Group, (2002) *Final report of the Women's Experiences in College Engineering (WECE) Project*. Cambridge, MA:

Hailey, C., Erekson, T., Becker, K., and Thomas, M., (2005) National center for engineering and technology education. *The technology teacher*, 65 (5), 23-26.

Levy, D., (2004) Foreign students share tales of visa woes in a post 9/11 world. *Stanford report*, May 25.

Pink, D. (2005) *A whole new mind: Moving from the information age to the conceptual age*. New York: Penguin Group.

Thottham, J. (2005) Off shore job myths. *Time Magazine*, New York: Time Warner, July 11.

Further Reading

Eggleston, J. (1974) *Contemporary research in the sociology of education*. London: Methuen and Co.

Eggleston, J. (2001) *Teaching design and technology*. Buckingham, UK: Open University Press.

Eggleston, J. (1979) *Teacher decision-making in the classroom*. London: Routledge & Kegan Paul.

Eggleston, J. (1967) *The social context of the school*. London: Routledge & Kegan Paul.

RESEARCH