A BLUE SKY PROJECT

Fresh Thinking

about learning and learners:
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A national project managed by the Australian National Training Authority
This Blue Sky Project focuses on fresh thinking about how people learn. Like many ideas, it evolved in a most organic way. Professor Rod McDonald, in his role as Special Advisor to ANTA, suggested that to achieve a world-class vocational education and training system, ideas about learning demanded more attention. At the same time, I was urging greater attention to new knowledge and fresh ideas about how our minds, brains and emotions influence teaching and learning, and the challenges posed by social, economic and technological change.

The work of clarifying exactly which ideas warranted attention and then building a useful package around them was the responsibility of Dr Jane Figgis of AAAJ Consulting Group in her role as Project Manager. Leonie Doyle managed the project at the ANTA end, which included overseeing the publication of these materials.

This booklet is the result of those efforts. It contains commissioned articles — what we call ‘think pieces’ — intended as a resource to refresh your thinking. The initial limited print run of the booklet was discussed with a range of people from the sector at a series of workshops held across the country. The universal enthusiasm for the booklet reflected the pleasure these educators took — from part-time lecturers to senior managers — in exploring interesting ideas about learning.

The authors of the think pieces, respected experts in their fields, had been specifically directed to be interesting and informative and not tell you how to do your jobs. The fact that you neither need nor want admonitions from outsiders about what you should or should not do was amply corroborated by the workshop participants. They liked the unresolved paradoxes threading through many of the pieces. They wanted to be the ones to resolve them, with their colleagues. They had no doubt that they — and you — will figure out any implications of the ideas in the booklet for yourselves, and that they will likely be very varied.

It needs to be said that not all of the ideas in the think pieces are new or startling. However, the context of learning in vocational education and training in Australia is so radically different after a decade of progress that even the most familiar ideas deserve to be reconsidered and possibly applied in new ways.

If there is a single word that captures what we hope to foster with the Blue Sky Project, it is a feeling of renewal. We trust these think pieces will contribute to that journey.
This project was established as a national project of the vocational education and training system, managed by the Australian National Training Authority. As a national project, it operates under the guidance of a reference group comprising representatives of the Commonwealth, States and Territories, researchers and education professionals, as well as ANTA.

We would like to acknowledge the support and valuable input from the following people:

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overview

The topics for these ‘think pieces’ came after detailed conversations with leading educators and vocational education and training sector personnel about what would inspire fresh thinking and renewed conversation about teaching and learning in the sector. There was no overall conceptual framework to start with, but as the pieces came in, we could see that they actually did fit together. But before describing that pattern, a run-down of what you will find in the pages that follow.

If you don’t know who the learners are — their concerns, their ambitions, their background — how can you know if you’re making a difference for them?

- Evidence of a lack of fit between today’s learners — their expectations of learning, their ambitions, even the ways they go about living their daily lives — and what many educators and trainers in the sector imagine.

The profound changes in the social landscape, many of which have sneaked in with little fanfare, have changed today’s learners. We need to understand this. We need to know who the learners in the sector are. One piece explores this idea and provides some insight into how to find out about learners without becoming a counsellor, therapist or guru.
Research in cognitive science is making clearer the difference between implicit and explicit knowledge and simultaneously revealing the profound importance of deep-seated implicit knowledge which operates well below the level of conscious thought. This is knowledge, contained in our minds, which we may be completely unaware of. Yet it shapes (and may be almost wholly responsible for) our capacity to perform well — to do things. (But if we know this immense amount of critically important stuff that we don’t know we know, how did we learn it?) How can it be taught? Can it be taught?

The changes in the economic landscape are delivering a world of work that is full of contradictions and paradoxes. On the one hand people are urged to be innovative and entrepreneurial but often obedience and risk minimisation is rewarded; they are urged to cooperate and work in teams, yet performance management often drives people to jump higher and higher in competition against co-workers. Workers are urged to give their best to the enterprise, but loyalty is not rewarded with security of employment. So this is a piece on coping with the paradoxes in the real world of work which is, of course, the world vocational education and training is designed to serve.

One of the things no one seems to have noticed is that by the way we assess learners, even in a competency-based system, we reduce their capacity to be self-determining lifelong learners — indeed, we actually reduce their capacity to be effective at whatever they do. How is this so? Simple: assessment is something that is done to learners by the expert, the judge. Learners get the unambiguous message that assessment is someone else’s business, not theirs. If that attitude sticks, those people will never improve, never reach a truly high standard — a sorry loss for them and for the nation.

If you’re going to be thinking anyway, think big...
The ever-expanding information and communication technologies are making it possible to create contexts for learning that were simply impossible in the past. The interactivity permitted through computer simulations is one example, but opportunities for human interactions can also be enhanced. Trying to understand how to capture the advantages of the new media is breathing new life and meaning into some old ideas about learning and teaching. And, it turns out, once laid bare, you can do a lot without technology.

Advances in the neuro-sciences, and particularly in neuro-endocrinology, has unpacked some of the intriguing relationships between emotions, memory and learning. It is now clear that philosophers and scientists made a grave mistake a few centuries back when they portrayed emotion and reason as separate, even opposite. Our emotions and our capacity to learn and remember are tightly coupled. Further, what we might have thought of in the past as cognitive factors inhibiting learning (speed of mental processing, for example) may in fact turn out to be emotional factors.

The world is awash in false ideas about what happens to our brains and minds as they age. If you are the type to take a pessimistic view, then the problems of old age start creeping in very early: certain mental abilities peak when we are in our twenties. On the other hand, our minds can stay agile, creative and productive through nine decades of life and sometimes longer. Cunning counters the weaknesses that do crop up with age. And our brains grow — literally, creating new connections — so long as they are exercised.

ELECTRONIC GAMES ARE POISED TO REPLACE PORNOGRAPHY AS THE ENGINE OF TECHNOLOGICAL DEVELOPMENT BECAUSE, IN THEIR PROMISE OF NEW EXPERIENCES, THEIR AUDIENCE IS WILLING TO SCALE FORMIDABLE LEARNING CURVES.

Ageing seems to be the only available way to live a long time
The seven think pieces can be folded into a single pattern if we think of learners as knowledge builders. The pieces describe various aspects of how a knowledge building entity (we are loathe to call our learners knowledge building machines) would go about its knowledge building business.

The first piece, a sort of introduction to a knowledge building entity asks: who are these entities and how can we find out?

1. **Who Are the Learners?** by Rennie and Wyn

Two pieces follow on the secret internal workings of the knowledge builder: so much of its thinking is unconscious; its emotions ruling not only its heart but its head:

2. **Implicit Knowledge** by Kirsner
3. **Emotions, Memory and Learning** by Merson

Then a piece about what happens to its internal processes as the knowledge builder ages:

4. **Ageing Minds** by Zubrick

Next we turn to the issue of inputs which one might feed a knowledge building entity if it is to be well nourished and function properly:

5. **The Learning Environment** from Wills, Hedberg, Little and Oliver

6. **The Real World of Work** by Whyte

Finally, one of the most provocative pieces of the collection: who is to judge whether the knowledge building entity has built new knowledge or skill:

7. **Assessment: have we forgotten something?** by Boud
Peter: Let's begin with the prime question: who are the learners and what are their needs?

Johanna: This is an important question because we are living in a time of rapid and fairly significant social change. People are living their lives differently from the way they did even one generation ago. A few simple facts that I find fascinating:

- In the 1970s 83 percent of women were married at age 25 (and the majority of them were mothers at that age); in the 1990s only 42 percent of women aged 25 were married and only a quarter of all women that age had children;
- In the 1970s 95 percent of men aged 25-34 were in full time work; in the 1990s the figure was down to 81 percent. For women the case was the reverse: 50 percent increase in the number of women aged 25 to 34 in full time work.

In other words, the evidence is compelling that the lives of Australian men and women have changed quite dramatically, and so have their families and workplaces. I think we sometimes forget that.

Peter: Your research has focused on young people today — those who were in their 20s in the 1990s. Were these changes reflected in what they said to you?

Johanna: Changes to these aspects of life, and many others as well, mean that young people who have grown up in the years after 1970 ‘know’ a very different world from those who grew up in the preceding 20 years. They are already having to develop new skills in order to live their lives. When they are studying, they keep other priorities in their life — most of them have part-time jobs and leisure stays a key priority. Education is acknowledged as being important, even essential for getting jobs, but it is only one of many responsibilities and options that need to be balanced.
Peter:
If they’re fitting their studies and training into what sounds like fairly hectic and crowded lives, does that mean they expect different things from formal education?

Johanna:
We asked the participants in our study what they expected to achieve as a result of post-school education or training. We found that they had high expectations for themselves — they certainly expected study would help them to get better jobs than their parents had. A majority not only hoped for, but expected that their studies would lead to secure, well paid professional or managerial jobs. In the following years, our interviews with these young people began to show their increasing disappointment and frustration with what was happening. After eight years of post-school education or training, only 47 percent of the sample had found what they would define as an on-going career for themselves.

So, there is a paradox — there has never been such an emphasis on getting an education, and yet at the same time, there is a growing acceptance that an education alone will not secure people the job they want. Education has become one element in a very uncertain world.

Peter:
Is this just about young people?

Johanna:
My research has been with young people - although they were well into their twenties at the end. But there is strong evidence that young people, far from going through an extended period of youth, enter a new form of adulthood earlier than the previous generation. The multiple interests and responsibilities, the pressure to make individual choices, the lack of certainty and the need to be flexible are characteristics of their lives that will not change in adulthood. Young people are living adult lives. If you think about it, many older people are also having to balance work and study, to change direction, to re-invent themselves and to bear the costs and risks of changing times — perhaps we could say they are living ‘youth’ lives.

Peter:
In your own teaching, how do you use this knowledge that the world of most learners and their expectations don’t match our old assumptions about who they are and what they want?

Johanna:
One thing that I can see — and this is across education sectors — is an increase in concern about our students’ welfare and well-being. That is becoming core business. In order to get that right and to teach in a way that enhances people’s opportunities and options, those who teach require up-to-date knowledge about their students’ perspectives and the world in which they live. To do this, at a minimum, learners would have to be involved as participants in education, not simply as recipients of it.
Peter:
But I can see lots of blockers to doing this. One issue is time. Teachers will often say, ‘There is never enough time to teach all the things I think the students need to know. Now you want us to do new things that will mean even less time to cover the material.’

Johanna:
What is your answer to this?

Peter:
There will never be enough time. Part of the answer involves developing a culture where students take more responsibility for building their own learning outside the structured learning sessions. If you can develop that culture you will be meeting a whole range of their generic needs. However, this is not easy.

One factor that blocks teachers getting to know their students better — to trust them more, even — is thinking they would be asked to do things they would not be competent to do. For instance when you get to know more about your students you get to know more about their problems. This might involve family issues or drug taking. Some institutions will have policies and procedures for a number of problems. But many problems will not be so clear cut. Most of us have a natural tendency to want to help when we become aware of a problem. How teachers should act when they become aware of a problem that they have no solution for or skills to address is a concern for them.

Johanna:
We are not asking teachers to be therapists. I am thinking about things as simple as knowing what part-time jobs students have — even how many part-time jobs they have! And finding out something about these jobs. Knowing about students’ hopes and dreams for themselves is also important, but it does not have to be very ‘personal’. Part of teachers’ professional knowledge includes being aware of protocols governing disclosure of personal information by students, and being aware of referring students to other professionals who are qualified to provide appropriate advice and assistance.

Very early in our discussions you made the comment that getting to know more about the needs of students could be used as a lever to make better use of adult learning principles. I’ll invite you to say more about this, but first let me have a go at recalling the principles.

Adults learn best when:
- The prior learning of the student is appreciated
- The subject matter is relevant to their immediate needs
- The learning environment encourages dialogue and interaction
- Mistakes are seen as valuable opportunities to learn
- The subject matter is presented using a range of approaches
Peter:
When we get to know more about the students we
can appreciate more about their prior learning —
that is the first principle and pretty obvious. Let me
skip to the third principle about encouraging
dialogue and interaction.

Getting to know more about the students and finding
a way to share this increases the social capital of
the group and that helps to generate a better group
learning environment where mistakes are handled
constructively and interaction is enhanced.

Johanna:
I’ve heard others say that before, but I think it’s a bit
simplistic. Many teachers will say, ‘Yes we know the
students have had all those other experiences but
they won’t share them.’ You’ve left out how you get
them to share it. That’s the hard part.

Peter:
Yes, I agree I have left out the hard part and I promise
to revisit that before we finish — it is a technique
I call reciprocal feedback. But for the moment let’s
get the idea out there on the table. Let me illustrate:

In the early 1990s Dr Steve Dunstone from the
Faculty of Dentistry at the University of Adelaide was
concerned about a number of groups of students
who seemed reluctant to participate in any activities
outside of the formal teaching activities and who
restricted their interaction with other students to one
or two colleagues. This situation remained unchanged
as the students moved through the course year after
year. Steve was sure the students’ learning was being
adversely affected. For instance interaction in small
groups was often (excuse the pun) like pulling teeth.
He also thought it might affect their enjoyment of
their career and their attitude towards involvement
in post graduate studies or continuing education
later in life. With the support of his Dean, Steve
spent a number of sessions with the first year students
helping them break the ice. They learnt a little more
about where their other classmates came from, and
what their interests were. Steve then followed the
progress of this cohort of students through the
course. The pattern of isolationist behaviour seen
in previous years had been broken and there was
a much higher level of interaction than there had
been in previous years.
Johanna:
Presumably everyone, student and lecturers had a more enjoyable time.

Peter:
I agree, although I can’t remember Steve talking about that.

Johanna:
You’ve introduced the term social capital, which is being talked about quite widely in Australia. It refers to the quality of relationships within a community or group. A group with high social capital will have a high degree of mutual respect and trust which is a precondition for an effective group learning environment. Could you say more about group learning environments?

Peter:
Our culture is oriented more towards the individual than the group and this has profound implications for learning. It is clearly related to what some people call the “Anglo” problem where on a statistical basis Australian students who have Australian born mothers and fathers seem to do less well academically than either newly arrived students or students whose mothers or fathers have migrated from non-English speaking countries.

When I was a medical student in the late sixties and early seventies I and about half of my fellow students would take ourselves off to the library, find ourselves a cubicle and “hit the books”. The other half of the students would also go to the library but instead of finding cubicles they would head for an open table where they would form a group and talk about their learnings. Most of the people who sat in the cubicles were Anglo and most of those sitting round the tables were Jews, Asians or first generation Australians.

Johanna:
You are linking the high numbers of Jews, Asians and new Australians doing medicine with their learning habits. You are suggesting that one reason for their disproportionate numbers relative to the rest of the population is that they make better use of group learning opportunities which gives them a relative competitive advantage.

Peter:
Yes, many cultures are highly competitive but how and when they compete is the issue. Do they compete as individuals or do they compete as a group? The old Chinese saying, ‘Friendship first then we compete’ epitomises the difference.

Our Anglo culture is oriented towards the heroic individual competing to win. This is okay if you are a high achiever, but for those who have little hope of winning, opting out becomes an attractive option. The emphasis on the individual is reinforced over and over again. From fairy stories to party games to corporate games in the adult world.
When I work with adults I spend some time helping them understand the gap between their espoused and their actual values. Many espouse the benefits of teamwork but sabotage it through their actions. I help them understand how their cultural baggage shapes their behaviour. Many want to be top dog. Others opt out of the fight for the number one post but fight to make sure there is someone else lower than them who can be scapegoated from time to time. These are major issues that affect nearly every group, every meeting and ultimately every organisation’s performance.

Johanna:
The focus on the individual is also very strong. The example that always strikes me in my own life as an academic is that collaborative authorship is assessed in many universities to be of lesser value than works that are singly authored. Rather than acknowledging that collaborative work can generate new knowledge that neither author would have contributed on their own, the contribution of each author to publication is viewed as a percentage of the whole. This is silly when you come to think of it because a collaborative paper takes much more time and is almost always of higher quality.

Peter:
Yes that is a paradox isn’t it. Part of the reason that collaboration takes more time is that the relationship usually needs to be developed before true collaboration occurs. With very few exceptions whenever a new group forms in our Australian culture the group has to set aside time to develop new norms if it is to function effectively. One of my favourite Abraham Lincoln quotes is: ‘If I am given eight hours to chop a tree I will spend six hours sharpening the axe.’

I think the same applies to groups and the way they approach tasks. As we saw with the Adelaide Dental school example, time spent strengthening the relationships within the group before the work begins is time well spent. Relationships within the group need to develop in order to neutralise the competitive agendas that most of us carry. Groups need to reduce fear and build social capital by maximising trust and respect. The same principles applied to you and me.
When you and I were invited to collaborate we decided to set aside time to develop a vision for our work. We did so to get to know each other. To say something of our own needs and wishes about our work together. Through sharing we developed mutual trust and respect. We wanted to make it possible for either of us to say what we truly thought, to be able to disagree in a respectful and robust way. And this happened. For instance I felt quite comfortable when you said earlier, ‘I think that’s a bit too simplistic.’ Given the short time we have had together I don’t think you would have said that as quickly had we not developed our social capital.

Johanna:
Perhaps. It has certainly been helpful to find out who the other person is that you will be working with. It applies to all working situations and is not just confined to teaching and learning environments.

Another issue that we discussed at the start was the importance of modelling the behaviours we were suggesting. I know you feel very strongly about this and it fits in with your belief that part of the solution lies in teachers taking up more fully their role as leaders.

Peter:
Whenever anyone talks about leaders and leadership you need to be careful. Because it all depends on what sort of leader we are talking about. Ask a politician or a barrister to define a leader and they are likely to say, ‘A leader is one who wins the debate.’ A soldier on the other hand does not want a leader who can win the debate. The soldier will emphasise different qualities. I think the best way to think about leadership is to look at outcomes. A leader is one who delivers the best outcome and in most cases that means a leader is one who can help his or her people both express and make the best use of their intelligence and creativity. With this preamble we can then say that we can assess leaders on their competencies to resolve three major questions.

**What and Where**
What is the current position and where are we going to?

**Who and Why**
Who really is the leader and why should we follow them?

**How**
How will the leader help us to organise our work to maximise the expression and use of our creativity and intelligence?
You can see that these questions can be easily applied to teachers. Leaders as teachers need the competencies to resolve these questions.

**What and Where**
*What is the current state of the group’s knowledge and where do we want to get to?*

**Who and Why**
*Who are you really as a teacher and why should the students learn from you?*

**How**
*How will you help us to organise our time together to maximise the expression and use of our creativity and intelligence?*

We haven’t the time to go into the three sets of questions in detail but you can see that the Who and Why and How questions relate to the teacher’s ability to develop the social capital of their group of learners. You can also see that to be a really effective leader you will need to let the students know something about who you are as well as be prepared to know something about who they are. In this model of leadership leaders need to be prepared to model the behaviours they want the group to adopt.

This modeling happens every day, but we don’t always recognize it because it is in the little things even more than in the big ones. For example, as educators our expectation is that things will go according to plan. But it’s usually not like that. Sometimes a student will criticize you — that usually comes out of the blue. The point is: the unexpected happens; the students develop a heightened state of alertness. If you handle the unexpected well they will increase their respect for you.

**Johanna:**
We began this paper by discussing my research. I’d like to hear something about your work. You have developed a reciprocal feedback process that incorporates many of the ideas we have been talking about. We have also used the process in our meetings. What is the reciprocal feedback process — how would you use it in an educational setting?

**Peter:**
The process helps teachers to capture thoughts and ideas that are not normally expressed. It provides a structure to analyse these comments and a vehicle called the “Backchat” for responding to those comments in a very powerful way. It gives the leader a platform from which they can model leadership. Students are sceptical at first but when they see the teacher responding constructively to their suggestions and questions they become engaged in helping the teacher create a richer learning oriented culture.
Johanna:
The French have an expression “l’esprit d’escaliers” which is literally translated as “the spirit of the stairs”. It describes the experience of leaving a meeting or a lecture and walking down a set of stairs and talking about many of the things that weren’t mentioned in the meeting or lecture room. The process you are proposing asks people to write down their thoughts to capture these often unspoken comments.

Peter:
Yes, these emerging responses and half cooked ideas provide rich material for the leader to thoughtfully build the social capital of the group. The process encourages people to put their name to their thoughts. This allows the teacher to model respect to individuals within the group for their contribution to the group’s development. Service to the group is rewarded especially when it is based on a criticism.

Johanna:
Processes are often hard to describe. Can you give me an example?

Peter:
Dr Annie Ross of the University of Queensland told me of one of her experiences.

Annie was using the reciprocal feedback process in her lectures and at the completion of a lecture on Aboriginal culture, one of the students wrote some particularly red necked racist remarks.

The next time Annie met with the student group she began as usual with the Backchat and she addressed the student’s comments. She said,

‘Jack, I appreciate that you had the courage to put your name to your comments. I won’t read them out. You know that I disagree with you. Nevertheless I am grateful that you have told me what you really think. In saying this to you I am also wanting to address everyone here. Disagreeing with me is not a problem. It’s the courage to own your own thoughts that I value.’

Johanna:
To respond like that requires a lot of maturity and skill.

Peter:
There are many teachers who are highly skilled and have great maturity. It’s just that they often have limited opportunity to demonstrate it. That said, the reciprocal feedback process is not everyone’s cup of tea. Like everything else the process requires work to master and it helps if people are trained in its use.
Johanna:
Can we ‘wrap up’ because we’ve covered a lot of ground here? What stood out for me was your basic idea that as an instructor, I can get to know the individual learners best by the whole group feeling comfortable with one another. It’s a little contradictory, but I can see the sense in it and in the whole social capital idea. The secret, it seems to me, is to recognise that as the teacher I am also a member of the learner group, not separate from it.

Peter:
It’s interesting that you’ve picked that. Those are ideas I’ve been putting into practice for a long time. What I’ve found myself coming back to are your initial ideas about today’s learners — of any age — not being like yesterday’s. We make assumptions about them at our peril. I think, actually, that is what we’ve both been saying: getting to know our learners is essential if we are to do our jobs properly and, when all is said and done, it is not such a mysterious task although it requires patience and willingness.

getting to know our learners is essential if we are to do our jobs properly and, when all is said and done, it is not such a mysterious task although it requires patience and willingness.
When one stops to think about it, it is clear that we do an immense amount of thinking unconsciously. A conversation in the staff room, for example, means comprehending what the other person is saying, perhaps smiling as she speaks (perhaps frowning), balancing your tea cup, noticing who else is in the room, and answering in grammatical — and most likely appropriate — sentences. That performance uses layers and layers of cognitive processing of which our conscious minds are largely unaware. The best estimate amongst cognitive scientists, in fact, is that as much as 95% of our thinking goes on ‘behind our backs’, as it were.

The recognition that the ‘unconscious’ mind may be as important — if not more important — as our conscious one, throws an interesting challenge to all of us educators. For if so much of knowing and even decision-making goes undetected by our conscious minds, how much of people’s learning is also implicit rather than explicit? How much should be implicit rather than explicit?

The operation of explicit and implicit processes is, of course, not recent news. It has often been described — typically as the contrast, between ‘doing’ and ‘knowing’. The parallel between doing/knowing and implicit/explicit is particularly obvious where sporting skills are concerned. I could acquire a mass of technical knowledge about a tennis serve for example, even including information about the physics and physiology of the action, while remaining utterly without skill on the tennis court. I could on the other hand attain a measure of competence at serving while remaining entirely ignorant about the physical and physiological principles underpinning my achievement. This second situation would require me carefully observing an expert, having that expert observe me and then getting detailed feedback about my performance. There would still be a gulf.
between my performance and that of the expert, but that too could be gradually resolved without increasing my conscious ‘declarative’ knowledge about the actual process.

This distinction applies to many, perhaps all, human activities. Where performance is an issue, knowledge comes in two forms — implicit and explicit — and these forms of knowledge are subject to different methods of acquisition, delivery and assessment. I must emphasize that ‘performance’ goes well beyond tennis or, indeed, any physical action. Competence in judging how to comfort a toddler in child care or in deciding what pesticide to apply (or whether to apply any pesticide at all) is also a performance and, consequently, will involve both implicit and explicit knowledge, implicit and explicit learning. This is a point I shall return to in a moment, but you might find some of the studies which demonstrate aspects of implicit knowledge interesting — see boxes A, B, C and D.

**Box A**

*Studies of explicit memory for words can be traced back more than a century. Typically, the subject is shown a list of 20 words, one by one, and then invited to recall the list. Most subjects will recall about 7 words from a list in this ‘explicit’ memory task. This number will decline rapidly, however, if the recall test is delayed for even a few hours. After a day or two most people are down to three or four words from the beginning or the middle of the list.*

Studies which attempt to explore implicit processes reveal a different picture: not only does memory of words persist, but often the ‘learners’ are wholly unaware that they have committed any words to memory. Imagine, for example that the presentation list included a word such as BUTTON. The subsequent ‘test’ might be one of stem completion. The subject is invited to complete three-letter word stems such as BUT __. They might be given 40 stems: 20 ‘old’ stems, based on words from the original list and 20 ‘new’ stems, based on words that were not present in the original list. Consistently, people will complete more of the ‘old’ stems than the ‘new’ stems.

how much of people’s learning is implicit rather than explicit?
Another example, possibly apocryphal, involves an attempt by the French Artificial Intelligence (AI) industry to develop a test for the ripeness of camembert. The story has it that the experts who classified camembert were convinced that they did so according to skin tension. Camembert was ready for display when it passed the critical ‘pinch’ test. The AI team reputedly spent millions of francs developing a ‘pinch robot’ but the robot did not deliver reliable results — it couldn’t tell whether the cheese was ripe or not. Subsequent research demonstrated that the experts were actually using smell and not skin tension to classify the cheese. They were pinching the camembert, of course, but this action released the aroma. They were then using the smell rather than skin tension to classify the camembert.

This story — not apocryphal — comes from the Human Resources field. Where personnel selection is concerned, experts form opinions about the variables they use to make decisions about applicants. But statistical modeling indicates that the variables that they actually use are not the ones they point to when they are asked explicit questions about their decisions. The critical point is that years of extensive practice often mask the variables or information that experts rely on. They have ‘automated’ the process and the consequence of doing so is to mask or reduce their access to the variables and information processing steps actually used to solve the problem.

In this essay, as you may have noticed, I am stepping carefully around questions about brain processes. It may or may not be the case that the distinction between implicit and explicit processes can be detected in brain imagery. It may or may not be the case that the distinction involves genuinely different neural structures and principles.

Some clues are available, however. Performance on implicit memory tasks, for example, is relatively if not absolutely untouched by ageing and even amnesia. In one famous study, amnesic patients were invited to work on the Tower of Hanoi puzzle where people are asked to move rings from one pole to another pole under restrictive conditions about the way in which narrow and wide rings are used. Amnesic patients show the same learning patterns as the non-amnesic control group. After about 50 attempts both groups are able to solve the problem and in about the same number of moves. The interesting feature, however, is that the amnesic patients cannot answer explicit questions about the training sessions. The skill that they acquired during the training sessions leaves a record that they can use in subsequent...
sessions, but they cannot recall those sessions or even, often, the fact that they have done the task before.

Whether research eventually demonstrates that implicit and explicit processes depend on the same neural structures or on different ones, what is important here and now is recognizing that there is a functional difference between the two processes. Both contribute to performance. I have been focusing on implicit processes because they have been less obvious — exactly because they are implicit! — and their importance to learning, skill acquisition, memory and decision-making are not always adequately recognised.

The importance of implicit processes has also been clouded by the fact that education and training are largely concerned with taking people up to a level of competence — learners are basically still novices when they acquire their certification. Expertise, which depends forcefully on a person possessing a large body of implicit knowledge, especially in the form of pattern recognition, comes later and is typically not seen as the province of formal education and training.

The examples in Boxes D, E and F were selected specifically because they demonstrate that implicit and explicit processes are complementary — both are critical to normal cognitive function — but also to emphasize the fact that their relative contributions to performance may vary from situation to situation.

There are certain conditions under which each mode has a clear advantage and under which the alternative mode is alone insufficient.

**Box D**

*Industrial process control involves monitoring large banks of incoming information. As controllers become expert at the task, they tend to build ‘pattern recognition’ models of the processes which enables them to recognize and manage systems at a glance. But these highly practiced and familiar cognitive processes can compromise controller performance when the system starts to malfunction.*

*The problem is that the very procedures that have made the controllers expert will predispose them to ‘see’ a normal and statistically likely event when they are actually confronted by a statistically improbable and potentially dangerous event. Problems of this type have been documented time and again but some of the best known cases involve accidents at nuclear power stations like Three Mile Island and Chernobyl. In each case the operators failed to use information that was inconsistent with their hypotheses that the power stations were operating normally. They clung to the perceptions and performance practices associated with normal operations, and problems that might have been tractable at an early stage rapidly developed into major disasters.*

*It is under these non-routine circumstances that explicit reasoning and decision-making processes are required. These operators actually had the relevant knowledge. The problem is that they stuck to their old and highly practiced routines in the face of contradictory evidence.*
Box E

Medical diagnosis is another area where people need to call on both implicit and explicit processes. Diagnosis involves many considerations, and many hypotheses must be considered.

In one study involving acute abdominal pain one group of students was given explicit training. They were provided with domain knowledge and diagnostic rules of the ‘if/then’ type.

A second group was given implicit training. They were provided with extensive practice involving simulated cases and they received immediate feedback about their decisions.

The results were unambiguous. The group that had received explicit training was better at providing verbal descriptions of their knowledge and they were better at answering questions about abdominal pain. But they were not as good as the implicit group when it came to applying their knowledge in a diagnostic task.

Box F

Bushfire fighters are provided with both traditional class-room training and practical training in the field. Both forms of training focus on the ability to predict, and therefore counter, the movement of fires in the bush.

The movement of a bushfire is largely determined by the angle between the flames and the fuel. If the fire is on a slope and there is no wind, the fire will move uphill because that direction delivers the smallest angle between flame and fuel. If the fire is on flat ground, but there is a wind blowing, the wind will bend the flame, reducing the angle with the fuel, and the fire will move downwind with it. If the fire is on a hill and the wind is blowing uphill, it is straightforward to predict the direction of movement of the fire: it will move up the hill. But the problem is not so easy when the wind is blowing downhill; the fire can now move in either direction depending on the relative contributions of wind and slope.

Experienced bush firefighters know all this and they correctly answer the easy questions. Yet when we tested them using examples of wind and slope pointing in different directions, a significant proportion failed to perform the prediction task accurately.

In sum, both forms of knowledge are required. Rapid, automatic and largely implicit processes provide the most efficient mode for normal operating conditions. However, the explicit and cognitively more expensive mode may be required to deal with rare and problematic situations.

A central question follows. Should training focus on diagnostic rules and domain knowledge or should it focus on extensive hands-on practice with simulated cases supported by feedback? The decision depends on the kind and extent of transfer expected from the training. In broad terms, the greater the similarity
between the learning conditions and the operational conditions for a task, the higher the performance levels that will be observed for that task. Knowledge or expertise that is acquired implicitly will be deployed more effectively in the implicit mode and similarly for explicit knowledge or expertise: it will be best deployed explicitly. It should be noted however that the similarity of conditions variable influences performance on implicit tasks to a greater extent than explicit tasks. When the question involves recall, the similarity between the learning and test environments will be less critical.

If, as educators, we were to pay more attention to implicit knowledge than we have done, then adjustments in our practice will be required:

- Learners will need more opportunity to practice: learning in almost every area of skill follows the power law or something that looks very much like it. There are enormous early gains in efficiency, but performance goes on improving indefinitely providing that feedback is provided. The period over which improvement is possible is of course as long as the proverbial piece of string. One colleague of mine tested himself for decades on an auditory acuity task, and found that his performance went on improving until he was well into his sixties.

- Feedback needs to improve: there is evidence from several domains that practice does not yield much benefit unless it is accompanied by immediate and accurate feedback. This does not mean exams at the end of the term; it means feedback at the point of performance. This approach may be made more economical using an artificial tutor or virtual master along the lines of advanced flight simulators.

- Transfer-of-training needs to be carefully considered: the training environment must honour the characteristics of the operational environment. This does not necessarily mean that it has to be equivalent to the real environment in all respects. It is now clear, for example, that aircraft simulators must honour critical variables only. Effective simulation does not require full detail and colour for the entire environment.

Explicit and implicit modes of knowing and doing are both important. The contrast between these modes should not be used to ‘sell’ a new way of learning. In other words, implicit learning has been recognized for centuries. The critical point is that many, and perhaps all, tasks that must be mastered in a complex society require and depend on both forms of expertise. As educators, we should honour the balance between them.

In many cases, it will be knowing when to make, and then making, a transition between the two modes that will prove critical. But that, as they say, is another story. There has been little research on the question of transition from one mode to the next and back again. That is an area where we really have to feel our way.
One of the most important, and early, research findings to cast light on learning and emotions came in the 1960s from the work of psychologists Richard Solomon and Martin Seligman at the University of Pennsylvania in the United States. Seligman was involved in the then commonplace behavioural research on learning or conditioning in animals. Following the research findings of Pavlov and Watson, he was studying how long it took dogs to learn to avoid minor electrical shocks by moving to a different area of the cage after being given a specific signal.

To his and his associate’s frustration, some dogs just could not learn and seemed to collapse into a state of helplessness in the face of what was actually a fairly straightforward learning task. Other researchers had observed this phenomenon, too, but dismissed it and concentrated on those animals who were successfully conditioned. Seligman, however, began to concentrate on the animals who seemed to be incapable of learning.

He soon moved from studying dogs to studying rats, and devised a number of important experiments. In one, he divided genetically identical rats into two groups. One group received random electric shocks to the floor of their cage the day before they were to undergo a traditional conditioning experiment. These rats, it turned out, were quite unable to learn to move to a different part of the cage on receiving a cue and displayed that familiar sense of helplessness. The untreated rats did perfectly well on the learning task.

This experiment pointed to some sort of neuro-biological response which seemed to be blocking or preventing the normal process of learning. Seligman called the effect ‘learned helplessness’ — the animal equivalence of depression — and linked it to the emotional state of the animals, in terms of hormones, induced by the random electric shocks.

A number of neuro-psychologists, intrigued by these findings, began to suspect that the hormones involved might be those normally associated with high levels of...
of anxiety and cognitive arousal, in particular cortisol [see box cortisol, this page]. Most conditions where we are anxious or being threatened involve short term arousal, and the mind/body homeostatic balance is restored relatively quickly. In the case of the poor rats, however, the exposure to arbitrary and repeated shocks to their feet created a condition of hyper-arousal or chronic stress.

Cortisol, the hippocampus and memory

Cortisol, adrenalin and noradrenaline are released when we are frightened, anxious or excited. It’s the classic fight or flight response first identified by Hans Selye in the 1930s. While adrenaline helps the release of energy into our blood, noradrenaline gets the heart muscles pumping to push it out into the muscles where it is needed. Cortisol heightens cognitive activity and acts upon an area of the brain known as the hippocampus.

The hippocampus is the area of the brain’s limbic system that is critical to the processing of memories and, therefore, crucial for learning. The hippocampus allows us to access memories and to update them as a consequence of more recent experience.

Under chronic stress, continual high levels of cortisol reach the hippocampus. Bruce McEwen from Rockefeller University in New York has been able to show in experiments with rats that sustained levels of cortisol cause the dendrites in the hippocampus neurons to shrink with consequent loss of connectivity. The effect of this atrophy in the hippocampus is that the ability to learn is diminished. The brain is unable to retrieve old memories or lay down new ones as it once could.

The hippocampus and fear

One of the other functions of the hippocampus is to regulate a near neighbour in the brain, the amygdala, which is the source of our fear response that allows us to react with extraordinary speed to perceived threats: for example, suddenly stopping on a relaxed bush walk at the sight of a piece of hose on the path, mistaking it for a snake. Our heart is suddenly pounding and our attention fixed on the object in front of us.

Under normal circumstances what the hippocampus does is allow us to search our memories for the characteristics of snakes and, being assured that its just a bit of old hose, it then communicates to the amygdala to stop sending danger signals to the adrenal gland which then shuts down the release of stress hormones and we calm down.

The problem is that when the hippocampus is under assault from high levels of cortisol to begin with, this communication function can be impaired. The amygdala continues to send signals to release stress hormones even when there is no real threat thereby further reducing our ability to return to a calm homoeostasis level.
The long term effect of stress is that more and more cortisol is released in what can become a degenerative cascade leading to sustained high anxiety. This is not just the experience of rats, it is also true for all mammals under chronic stress. Sustained emotional distress severely diminishes our capacity for effective memory and learning. Most of us experience the consequence during times of personal crisis. We forget appointments, lose keys and wallets and we become tunnel visioned and fail to take notice of crucial information. Basically it prevents the creative involvement of an individual with his or her environment. Being able to respond creatively to one’s circumstances is one of the characteristics of resilience.

Disturbing socio-economic findings have come from the work of Michael Meaney and Sonja Lupien at McGill University in Canada. In their research into the relationship between emotional distress and learning, they have found that children of low socio-economic status, before the age of fourteen, have on average three times higher cortisol levels than their contemporaries from a higher socio-economic status. Lupien has concluded from these findings:

“What we know is that accumulated exposure to high levels of cortisol will impair cognitive function. If cognitive function is impaired just a bit, the child may not want to go to school because it’s difficult to learn; or might quit school and stay in low socio-economic status for the rest of his or her life ... keep having high cortisol levels and in the long run develop a memory deficit and hippocampal atrophy.”

In this sense the vicious cycle of poverty and disadvantage is reinforced.

The good news...

Although research tends to focus on the consequences of long term negative emotional states for learning, work has been done on the all-important aspect of understanding what are the optimal emotional conditions for learning. The University of Chicago psychologist, Mihaly Csikszentmihalyi, has developed the concept of flow to describe a state of absorption and concentration which seems to strike exactly the right emotional balance. In studying high performers engaged in the arts, sports and sciences, he consistently found a condition of calmness, a lessening of cortical arousal, and an associated state of heightened well being. It could be considered to be the opposite of anxiety and distress described earlier. As Csikszentmihalyi puts it:

“People seem to concentrate best when the demands on them are a bit greater than usual, and they are able to give more than usual. If there is too little demand on them, people are bored. If there is too much for them to handle, they get anxious. Flow occurs in the delicate zone between boredom and anxiety.”

Rats show a similar phenomenon. If they have not been unduly stressed beforehand, rats confronted
with the challenge of a maze in which to find their food will show higher levels of intelligence and have a continually more robust capability to learn into old age. Even for rats the right amount of stimulus or challenge improves learning.

It is also the case that a propensity for fearfulness leading to stress is not inborn in individuals. A revolution in neuro-imaging over the past couple of decades has made it possible to pinpoint the specific locations in the brain where the neurochemicals of emotion actually operate. With this cartography of our emotional cognitive processes has come interesting evidence about the plasticity of the developing brain and our temperament.

Watching activity in regions of the brain associated with fearfulness, Richard Davidson and Ned Kalin have found that those people who are habitually pessimistic, fearful, timid and anxious, have both high cortisol levels, and a heightened activation in an area of the right prefrontal lobe, but diminished activation of the left. In the case of people with more resilient, optimistic and confident temperaments, there is higher activation in the left prefrontal lobes. As adults, we mostly strike a stable balance between these two poles.

Children, on the other hand, can exhibit quite extreme fluctuations. Many three-year-olds who are timid and anxious become extremely confident and resilient six year olds, and vice versa. By the time children reach eleven, their temperament, or responses to challenges and life’s stresses, tend to become more predictable or fixed — and so is the balance between the left and right prefrontal lobes. While this suggests that many of the preconditions for patterns of behaviours that make learning difficult may be set by puberty, as many educators have argued, what Davidson and Kalin’s research suggests is that genetics may be far less important in the process than was once thought.

Like the thermostat in a house, our emotional response to the challenge of new situations and opportunities to learn could be set either as one of anxiety and fear of failure, or one of confidence, resilience and creative engagement. The important point is: it is ‘set’ in response to one’s experiences, not determined by genes.

**Educational implications...**

What are the implications of this new understanding of emotions and their influence on our capacity to learn? There are doubtless many. I would highlight three that I believe are critical to effective teaching and learning. These are the three, at least, that I am very conscious of in my own work as a teacher:

1. **Poor learning outcomes might be related to emotional not cognitive factors**

   The question we must ask ourselves when educational and training outcomes are poor is: what is missing in our understanding of the
possible causes? When we observe poor concentration, an inability to grasp even simple concepts and apply them — we may choose to say that person X is a bit dim, has poor learning skills or lacks motivation. All of which might be manifestly true. But there may be underlying emotional conditions that make the sort of creative absorption in the learning process difficult, if not impossible. Similarly, in the case of the long-term unemployed where strategies for equipping them with skills for re-employment seem often to fail for no good reason, we fall back on pejorative stereotypes when we might look elsewhere for a cause.

I would argue from the evidence we now have, that we need to pay much greater attention to the emotional state of students than we have in the past and to find ways to help them address those factors of anxiety, fear and depression which are associated with memory and learning difficulties.

(2) Emotional self-awareness ought to improve learning ability

Howard Gardner’s Project Zero, which was established in the 1980s, has been exploring the idea that there are a number of different forms of intelligence that can, and should be, cultivated. Personal intelligence is one. Gardner defines personal intelligence as having access “to one’s own feeling life.” It means having the capacity to recognise one’s emotions, discriminate amongst them and, eventually, to label them and draw on them as a means of understanding and guiding one’s behaviour.

In other words, people need insight into their own emotional responses, if they are to begin to overcome the more debilitating consequences of anxiety and lack of confidence in relation to the learning process. But emotional self-awareness is also useful when learning is going well — when the learner is in a ‘flow’ situation — because then, too, the person needs to recognise his/her emotional state. As the neurologist Antonio Damasio has argued, if people are not in touch with their feelings not only is their capacity to reason impaired but so is the capacity to find pleasure and delight in learning. Emotional autism does not lead to greater cognitive ability.

(3) The ‘right’ balance is needed in students’ emotional as well as cognitive load

What most teachers understand as commonsense is that a staged mastery of cognitive or technical skill builds the capacity to learn. This is similar to the point Csikszentmihalyi made (referred to earlier) that optimum engagement with learning, as with any activity, lies in that zone where the challenge is demanding enough
to be enticing, but not so great as to be daunting. The interesting point is that the cognitive challenge is couched in the emotional terms of ‘enticing’ and ‘daunting’. Designing the best cognitive tasks is a question of getting the emotional levels balanced between pleasure and fear, confidence and anxiety. It is a matter of developing learners’ capacity to rise to the challenge of the unknown and the difficult without being emotionally overwhelmed.

The critical issue for educators is how do we help more of our learners to be less stressed. As I have tried to argue, the social and personal costs of failure to address this issue is to condemn an increasingly large number of people to a life of diminished intellectual and learning ability.

A starting point may well be the levels of emotional self-awareness on the part of us teachers and trainers. For it is we who need to be able to identify if the problem a student has in learning is predominantly emotional or cognitive, and to be able to adjust the teaching strategy appropriately. While this may seem idealistic, given the pressure on teachers, the classroom or training room context, and the very limited background we have in addressing this problem, nonetheless I believe it is an objective worth working towards.
Memory is not like a container that gradually fills up; it is more like a tree growing hooks onto which memories are hung. PETER RUSSELL

Almost everyone I meet, when they learn that I am interested in ageing, memory and learning, complains to me about some aspect of their memory and capacity to learn. One might not be so surprised if these ‘complaints’ came from people in their fifties, sixties or above. But such comments come just as often from young people concerned about their ability to recall names, the time it takes them to read and process certain types of information, a quirky fondness they observe to remember the trivial, and the uselessly absurd. Why, they want to know, do they continue to remember effortlessly the date of the Battle of Waterloo, the Chinese word for star, and Krebs citric acid cycle while simultaneously having difficulty recalling where they left their car in the supermarket car park or the name and birthdate of their partner when suddenly asked for it at the Medicare desk?

Memory and learning involve a chain of electrophysiological and neuro-chemical changes in the brain. These changes are very difficult to study in the human brain, but variations in them probably account for both the wide differences we observe in memory within individuals — reflecting such things as interference, stress, fatigue or distraction — and with age. There is no doubt that memory tasks become more difficult and frustrating with age. A slowing in the uptake of glucose by brain cells is one factor (meaning that as we age we are better off eating a little and often for effective brain work). Performance stress also affects performance negatively the more we age.

THIRTY
Industrial accidents sustained by adults as they age tend to involve being hit by moving objects or tripping and falling — in other words, slowness in getting out of the way or in recovering balance — whereas younger people’s accidents tend to be the result of rashness or lack of experience. The same is true of traffic accidents — older people fail to react quickly enough in time to rapidly changing situations, while younger people take undue risks.

What may be ‘lost’ in mental agility, however, can be partly or fully offset by increased knowledge gained in the course of experience. Warner Schaie’s research, for example, shows that while there is a gradual slowing in overall cognitive ability at the beginning of the sixth decade, the acceleration does not begin until the start of the eighth decade. Two aspects that have been explored in some detail are fluid intelligence (tests and tasks which measure our ability to process things rapidly) and crystallised intelligence (measures of accumulated knowledge such as vocabulary and general knowledge). Crystallised intelligence is maintained or increases with age!

While evidence that we are capable of effective learning through our sixties and seventies is accumulating and persuasive, it is nonetheless obvious that we are not the same learner at 75 as we were at 18. Perhaps the most characteristic age change is that performance becomes slower.

The research suggests that as we age the rate at which the nervous system can receive and transmit information becomes slower. If the rate of information is not under our control, then we are likely to make more errors than are the young. However, when we are in control, then slowing things down also keeps our error rate down. Thus, in playing chess, younger players appear to consider a wider range of moves, while older players appear to analyse situations more deeply. These and other adaptations involve plasticity — a patterned, ordered alteration of organisation to brain cells.
Nonetheless attempts to correlate changes to learning ability and memory with structural changes in the brain remain on shaky ground. Neurones do begin to dribble away, but even by the time we are eighty we have lost only some two-percent of our total neuronal complement. If we remain active learners, we have the added bonus of a new lush crop of dendritic connections. The best guess here is that this is the means by which the brain compensates for neural loss. As one writer has put it: “The brain does not go gentle into that dark night. It sprouts and the sprouts give us hooks.”

Accepting such changes, then, would an adult be ill advised to even contemplate taking up a course requiring some level of mathematics if they failed the subject from year five to year ten, when they mercifully ‘dropped’ it? What kinds of learning challenges might be considered ‘prudent’ choices in one’s fifties or beyond? Are there others best left to one’s teens? Is there a ‘peak’ age of intellectual performance and, if there is, how might this knowledge influence approaches both to teaching adults and to our own continued learning?

This is a difficult question to answer quickly or precisely. Learning takes place when we store concepts for later use and application. We have known since the 1970s that people trained on a limited context learned concepts more quickly, but then had more difficulty applying concepts to new situations than those who had varied training experiences. During this process a series of associations appears to be built in memory that serve one well for applying into broad experience.

Some researchers claim that age-related changes in our ability to learn and remember is only a cruel hoax, behaviour brought on by social expectations rather than demonstrable cerebral decline. At Harvard University Becca Levy and Ellen Langer determined to examine forgetting in response to the culture’s negative stereotyping of old age. They selected for their study average older Americans and older deaf Americans — reasoning that the older deaf subjects would be relatively protected from the slurs of old age — and also to older Chinese citizens, who experience respect and value. Both deaf and Chinese older adults out-remembered the average older Americans and the older Chinese subjects performed as well in memory tests as did young Chinese subjects. Levy and Langer’s research suggests that when Grandma can’t remember where she put her keys, it’s because no one expects her to.
Human memory is not a container or a computer. It is an inventor, an artist, a poet, a storyteller—remarkably flexible, durable, and adaptive. It becomes what we make it.

This information accords well with what we observe in real life experience and situations. In general we forget things because they are meaningless. Nonsense syllables are forgotten faster than real words. Put the words into sentences, and they’re remembered better. Sentences that become part of a poem or a story are better retained. Make that story powerful, personal and meaningful, and you’ve got the information for a long time—maybe forever! We remember (learn) by building onto an established network of associations and relationships. The more associations that can be constructed, the better. This builds the branching and rebranching of the fractal snowflakes that form neural circuits in our brains.

So, knowing and reaffirming these principles, one task becomes that of building associations for us and with our students. But our associations are not as powerful as their associations. And associations can be made in different ways. They can be sensory, motor, semantic, visual, analogical, mathematical or whatever.

To sum up, then: what may be ‘lost’ across the years in mental agility can be partly or fully offset by increased knowledge gained in the course of experience. The period of ‘peak’ performance is not restricted to one’s twenties, but can last through one’s adult life at least until one’s sixties. The important thing is not to stereotype learners of any age. Encouragingly, lots of people don’t lose much of their mental agility at all. Give older learners more time to assimilate information and they’ll do as well as their younger counterparts. They may even do better because their associations and experiences are likely to be richer. Have learners of all ages spend time sharing their strategies for understanding and remembering with one another.
Methods which are permanently successful in formal education... give the student something to do, not something to learn, and the doing is of such a nature as to demand thinking.

JOHN DEWEY, DEMOCRACY AND EDUCATION, 1916

Few educators, then or now, would disagree with Dewey’s observation. But actually following its logic — so that teachers design their instruction (not only their assessment) rigorously in terms of what learners will do, not in terms of what they, as teachers, will do — has proved elusive.

In the past decade, computational and communication technologies are giving us new and powerful tools for devising activities for learners which are “of such a nature as to demand thinking”. More importantly, the new opportunities opened up by e-learning have effectively forced us to think afresh about what it really means to say learners should be “given something to do, not something to learn”. Problem-based learning has a contribution to make here, too, because it is revealing the nature of problems learners might grapple with which are genuinely about ‘doing’ not about ‘something to learn’. To anticipate a bit: the problem must be a real one and a major challenge where learners feel they are coming to grips with messy matters of substance.

The first thing that happens when students’ doing is placed fully at the centre of education and training is that a number of discomforting ideas come crowding in. Under such an instructional model:

Wills, Hedberg and Oliver are all specialists and acknowledged leaders in e-learning, as the learning based on electronic computer information and communication technologies has been dubbed. What we wanted to find out from them was whether designing learning around the technologies had revealed anything new about learning in general.

We met and talked with them and quickly discovered that the new technologies are providing interesting avenues of experimentation. The evidence accumulating is that computers, used well, open up an immensely rich learning environment. They allow certain kinds of activities (simulations, for example) and interactivity (chat rooms for people geographically distant) that would not previously have been possible.

But interactive, active learning existed long before the new technologies. So we also approached Penny Little, a leader in problem-based learning, both as practitioner and researcher, and included her in this extended conversation. Our focus, it is important to recognise, is about learning environments and only incidentally about the techniques of e-learning itself, since much material has already been produced about e-learning for the vocational education and training sector.

“Methods which are permanently successful in formal education... give the student something to do, not something to learn, and the doing is of such a nature as to demand thinking.”

THIRTY-FOUR BASED ON CONVERSATIONS WITH SANDRA WILLS, JOHN HEDBERG, PENNY LITTLE AND RON OLIVER
 Transmission of content is not important.

 Learners don’t have to be taught something before they can do it.

 A learning environment is not a teaching environment.

 If you’re a good teacher, you don’t teach.

 Activity-based educational design makes sense of these rather peculiar statements. It is the purpose of this paper to sketch out why, and how, that is the case.

 It is useful to think of an activity-based learning environment as made up of three connected elements: (1) the tasks which the learner will engage with; (2) the resources needed to successfully accomplish the tasks; and (3) the support the learner requires in the process. Each element contributes to the learning, each makes clearer where the challenging ideas at the heart of doing/thinking-based learning come from.

 Learning tasks

 Inventing appropriate tasks for learners is critical. At one level this is not difficult, especially in a competency-based system like the one which operates through Training Packages in Australia. Competencies are written in terms of what students will do at the end of their learning. The trick is to find tasks which novices can do which will generate that learning.

 The first requirement of a task is that it provokes the curiosity, engagement and interest of learners. We have discovered, however, that we need to be very careful here. There are many activities which can be quite absorbing but where the task becomes an end in itself — it degenerates into the student simply doing something. To avoid any confusion, we have begun to talk about a goal-based rather than task-based learning environment — to underscore the point that the task is a means to an end not simply a way of keeping students active. The task must create opportunities for the learner to explore the knowledge domain and lead them to manipulate what lies in that domain.

 A well-designed task allows learners to discover the limits of their present learning. Being able to discover for oneself what one doesn’t know — to experience it — helps maintain a sense of purpose as they work. If learners need to go off to read something or to practice a skill, they do so with their purpose in mind. Recognising one’s own limits, one’s own mistakes, is also a great deal more powerful, yet less intimidating, than someone else telling you that you haven’t quite ‘got it’.

 Often a ‘well designed task’ is a problem set for learners: an interesting and engaging problem, it is usually tightly specified by the instructor and the solution is more or less clear to the instructor beforehand. That is very valuable, but it is not
actually problem-based learning — at least not as the term is officially defined. In problem-based learning the problem is messy and the problem is the curriculum. Everything builds around it and consequently the unit or course might go off in rather unexpected dimensions. The problems have multiple solutions and there are multiple learning paths to arriving at them. There is a variant of problem-based learning called ‘generative learning’ where learners generate and solve their own problems instead of a pre-defined one.

In all these cases, however, the task or problem allows three complementary aspects of learning — skill, knowledge and attitude — to be aligned together. An imaginatively constructed task will braid together the cognitive, emotional and contextual dimensions of a competency or, better still, a set of competencies. It is also the case that when learners complete a well-designed task successfully, that is sufficient evidence that they have acquired the skill, knowledge and attitude required. One should not have to split the dimensions apart again and ‘test’ them separately.

Learning supports

Performance support systems provide the guidance and, above all, the encouragement which all learners need and deserve. One of the things that has been learned in work with e-learning is that, while it is useful (and possible) to build feedback to students into electronic programs, learners still need ‘real life’ people to be in contact with. What they need most, in fact, is someone to listen as they reflect on their learning. So it is not exactly feedback on the activity that they need from us — although that is, of course, important — but feedback on their thinking about the activity, what they have gained from it and how they feel about it. This needs to be an explicit process: possibly conducted through email, possibly in person.

Problem-based learning introduces — and emphasizes, too — a reflective element in the learning cycle because a potential weakness in experiential learning is that the learner fails to examine what has been learned. The way around this is for the instructor or assessor to insist that the learners justify their solutions and critique what they have done. They ask questions like: What made you think that was a possibility? Where did that idea come from? Would you want to do anything differently if you were to do it again? The purpose is not simply to think about what they did in that instance but to help them develop their own critical frameworks for analysing their learning and decision-making.

A proper learning environment is a humane environment. The ideal is to establish true communities of learners. Few of us believe we are doing this as well as we would like — especially where the new technologies have meant we are conducting conversations through the ‘ether’, not face-to-face. We simply do not understand the underlying dynamics which might reliably generate virtual communities — we probably don’t know enough about how real communities of learners operate. There are, of course, lots of positive examples of learners working together — recently one of us moderated a role-play where students developed a technology policy for a school through e-mail. But we are still just feeling our way.
Providing support to self-regulated learning is, inevitably, a balancing act. As teachers (guides...facilitators...there are lots of words in play), we need to build scaffolds to support their learning, but then gradually take these away, hoping that the learner has gained the strength and skill to keep going. Explicit learning contracts or learning schedules and very clear learning guides offer valuable support to learners at all stages, but are particularly important at the start of their course.

**Learning resources**

The ‘learning resources’ component of task-based education is, in part, the course content and underpinning knowledge. Thus, resources include the manuals, notes, books, lectures, case studies, references, web links, worked examples, etc which ‘deliver’ the knowledge-skill base. In an on-line environment, it is easy to extend the notion of resources further to quizzes, for example, with the learner then directed to particular on-line tutorials depending on the answers. Many of these elements have been built into the Tool Boxes supporting Training Packages.

The essential element in providing resources, however, is that they give learners choice. Choice is important as a general principle for robust learning, but may be particularly useful in the face of some consistent concern that the vocational education and training sector, with its very formal system of competencies, qualifications and Training Packages appears almost to have removed freedom from the learners — removed a sense of responsibility on their part.

It is important to note that competency-based training and problem-based learning are not incompatible. Within both frameworks, one is ultimately putting the learner in a real-life or simulated situation and asking what they would do in such-and-such a contingency. Why did you make that response? Was it your intuitive understanding of the situation? Your skill? Your perception of the norms and values of the workplace? Someone asked in a written exam probably would give a ‘correct’ answer, but on the spot and in context he or she is much more adequately tested.

One of the interesting realisations all of us have come to is that it is best to provide learners with more resources than they need. It is a bit more like real life: they have to choose and decide for themselves whether they have used enough — and which of the conflicting messages are the ones to believe!

We need to make sure the emphasis in the learning is not on the content itself but on learning ways to make meaningful use of it.

The tools available through the new information and communication technologies, and the plethora yet to come, enhance the learning environment, there is no doubt about that. But the desirability — we would say, the absolute necessity — of abandoning the notion that teaching is about transmitting information in no way depends on new technologies. Dewey knew how to do it 90-odd years ago. It is about providing a learning environment — not a teaching environment — where learners have been afforded tasks which “demand thinking” and are given the support and resources to successfully carry them out.

The trick to being teachers who do not ‘teach’ is to consistently keep in mind, while we observe and help learners, a single question. What exactly are they engaged in?
Even though I have worked in education, human resources and management for years I am confused by the contradictions I experience almost daily between the harsh, dog-eat-dog, aggressive, competitive world of employment portrayed in the media and the desire of so many of my colleagues, their friends and children who want a job that is meaningful. It is almost as though the road-rage syndrome has infected the world of work, where ordinary, nice individuals think they want to hire high-achieving, driven individuals who will be ‘performance managed’ to jump higher and higher against an ever rising bar. And the paradox grows as organisations talk about value alignment and attitude as keys to success but remunerate selected people with share options, bonuses and commissions that reward individual, rather than team endeavour.

Only this morning a bright, young marketing manager bemoaned a salary rise negotiation she was having with a lead telesales person. He wants a higher salary as he gives 120 percent, provides leads for everyone and helps wherever and whenever he can. Popular wisdom and HR tell her she should maintain his base salary and give him a bigger sales incentive. He says that will make him hoard leads — either to himself or his team — and feel less free to help everyone. What should she do — follow popular wisdom and HR advice or agree to his logic?

The contradictions abound. We teach leaders to focus on long-term strategy, but commonly use short-term tools like downsizing and restructuring to desperately deliver short-term results acceptable to relentless financial markets. Boards talk about recruiting a leader, but often hire a technically skilled manager. It’s safer. Or is it? Many of us now hold shares in telecommunication companies and big banks. How do we want to balance the return on our investment — in dividends or increased share value — against the transfer of work from service providers to consumers (us) and the closure of our nearest bank branch?

For sanity, and for more than mere surviving, the people I talk with seek reciprocal and personally meaningful roles. Yet popular spin suggests competition and mindless consumerism dominate.
There is a second puzzle. The concept of business itself and the adjective it spawned — ‘business-like’. ‘Business-like’ might have been an accurate adjective when it came into our language, but not any more. In many, probably most organisations, things change too quickly and too often to bed down into tried and true ‘business-like’ processes. Much of work and management of business involves making things up as you go along. This is particularly true in small and medium size organisations where most Australians work.

Recent evidence that most of these businesses have to make up how they do things as they go along way in implementing the GST. Advice and information were available, but only the businesses could manage the actual implementation and, as you may remember, many left it to the last minute. But since the system itself kept changing, there was no option but to make it up as they went.

Other examples of business behaviours that seem un-business-like include auditing practices associated with collapsed companies, pricing strategies that guess how the market will value something, mountains of paper in offices with paperless technologies, masses of dot.com companies that could not explain how they would actually make money and masses of investors willing to hand over their money without knowing how the dot.coms would make money — blind faith or greed seem the dominant trends. This rather un-business-like business world is the real world where many of our students, and us, work and play.

One curiosity: business may not be business-like but teachers in all education sectors may be surprised by the business-like nature of some of their capabilities and behaviours. As a contribution to the NSW Review of Teacher Education, a young graduate analysed where people who left teaching went. The largest single group went to middle management roles where their planning, communication and delivery capabilities were held in high regard and remunerated above, and sometimes at more than double, their teaching salaries.

Is it the relentless tyranny of preparation and delivery or judging the capacities of others and recognising what they need to learn that make teaching such a powerful training ground? It certainly produces a set of skills that appear to be more valued outside the classroom than within. And if the real value of property is the price you get on the day of the auction, are we seriously underpaying teachers? Is the whole education and training system out of whack? There is certainly a great degree of disillusionment about it — from the inside and the outside. I was a guest at a TAFE function recently. I was struck by the limited nature of the discussion about change amongst senior teachers, deputies and principals.
There is another contradiction in the world of work. But let me introduce it by posing a question. What do the following people have in common — Bruce Beaver, Ben Chifley, Jon Cleary, Bruno Grollo, Reg Grundy, Lang Hancock, Henry Lawson, Eddie Mabo, John Shaw Neilson, D’Arcy Niland, Kerry and James Packer, Shirley Smith (‘Mum Shirl’), Maggie Tabberer, Elle McPherson?

The answer is that they were all singularly unsuccessful at school and did not pursue further education. But neither did they become part of the under-educated underclass. Their learning stories are different but have one thing in common. They learnt informally, from experience, when they were ready. My impression is that we have not adequately balanced, or recognised, the vast array of inputs that build our knowledge and skill and encourage us as learners. I am aware that competency-based training and education goes some way towards this — at least in principle. But I wonder if it sufficiently ‘un-corrals’ education, so that those who need to have space to learn in different ways at different times can.

Charles Handy talks of ‘planting the golden seed’ — identifying the talent that a person can grow within themselves. Is this the mission of education in every sector and of every teacher...every day?

In former economic times, that ‘golden seed’ would have been further nurtured and grown through work — specifically, through employment, having a job. But another new twist in the world of work is that secure employment is decreasing, perhaps disappearing. An alternative pathway for putting our talent to work is through entrepreneurship. Entrepreneurship is often misunderstood. Entrepreneurship is not about getting rich at the expense of someone else. Rather, it is about exploiting opportunities. First identifying opportunities for adding value in a market place or, indeed, in a social setting. Then evaluating whether the opportunity is worth pursuing. If the answer is ‘yes’, then the entrepreneur gathers the resources (financial, human, technical) to see the opportunity realised and new value created.

Identifying new opportunities — what one might call having an ‘opportunity orientation’ — is a skill, a habit of mind, which can be learned. A simple example: one vocational instructor starts all classes with an Opportunity Dump: a piece of chart paper pinned to the wall on which her students recorded all the opportunities they had observed since they last met. Students are encouraged to open their eyes and ears. Each week a different opportunity theme is suggested: technology, for example, or advertising, streetscape, transport, current affairs. The point is we should — and we may well be forced to — think about the world of work not as a world of jobs but as a world of opportunity.
Having pointed out some the oddities, if I may call them that, which I observe in the real world of work and workers, it is paradox that dominates. The demand:

to be competitive and cooperative

to be me-first and you-first

to be short-term winners and long term strategists

to be voracious consumers and gentle community-builders

to be valued workers and poorly paid

to be keen to work and disinterested in jobs

And, I guess as well, to be self-taught and teacher-dominated. Yet, what is fascinating is to see how well some learn to operate in this environment. In many cases people survive and survive well. Somehow, a lot of people learn the essential behaviours and master the essential technologies. If, however, we are doing this because and despite the systems, are there some things we could change so that managing paradox does not reduce initiative and steal energy from the main game?

I wish I could give you an answer. As I said at the start, I remain puzzled even though my work for many years has been to advise and help others find their way in the world of work and business.

Perhaps it is simply natural for humans to live with contradictions. Perhaps it is an ordinary challenge — not an extraordinary one — to balance these tensions. Perhaps it is largely a matter of accepting the contradictions and complexity as the price for the enormous diversity of opportunities and experiences available.

Finally, one thing I do know. This paradoxical world of work requires many skills. The list of what I think is important contains some of the now familiar ones of problem solving, team playing, being enterprising, strong interpersonal and communication skills.

Those are viewed by students and employers, too, as ones that make the difference at work (and at play), assuming the capacity to perform the technical functions of the role are already in place. I would add three others which are not always noticed but which, in my experience, are critical. They are: stamina, self-insight and a capacity to manage one's own career and life — in and out of the paid workforce.

perhaps it is simply natural for humans to live with contradictions
Assessment practices have been transformed with the move to a competency-based environment. We gauge performance and place much less reliance on one-off tests of knowledge. While in practice it still falls short of what is desired, at its best, assessment now involves judging the quality of learners' output or service delivery in holistic ways in meaningful situations. Curiously, though, despite these changes in what assessors do, learners' approach to assessment, and thus their approach to learning, has not altered as much as we might hope.

From the learners' perspective, assessment is still something 'done' to them. They don't see it as part of their learning, but as a check by others on them. Learners have been — and still are — given the unambiguous message that it is others who understand the criteria to be applied to their work and that these expert others alone can judge whether the criteria have been met. Learners are given no role in considering criteria for assessment or in working out how to apply these criteria to their learning.

The unintended consequences of this regime are serious and long-lasting. When they leave the confines of the training room, or even the on-the-job training task, most people are ill-equipped to recognise cues which might indicate what is good quality work, or what distinguishes good from not so good task performance, or to work out for themselves whether they need to improve, learn more, ask for help or suggest an innovative change to what they are currently doing. Yet, it is attention to these matters that makes people effective in what they do. It is this understanding of what constitutes effective practice that enables learners to pursue it when they do not have assessors standing by them. It is this feature that makes us say in everyday life that one person is...
really competent, but another needs prompting all the time. And, as we are all aware, we are entering a period in which the key question to be asked of a curriculum or competency framework or assessment scheme will be: what impact will these have on learning beyond the immediate?

By deliberately keeping assessment out of the hands of learners, we are denying them one of the essential tools — perhaps the essential tool — which enables them to become lifelong learners. For if there is to be lifelong learning, there needs to be lifelong assessment. Sustained learning requires sustained assessment. And the only person who stays with the learner throughout this period is the learner themself. Actually, I prefer to use the term sustainable assessment because of its overtones with the idea of sustainable development, defined in the 1987 Brundtland Report as ‘development which meets the needs of the present without compromising the ability of future generations to meet their own needs’. In assessment we are not thinking of future generations, but of learners meeting their own needs after they have left formal education and training. Assessment has to meet the present needs of certification but it must also forge the capacity to assess one’s own performance (and that of one’s peers) and then to assess whether, and what, further learning is needed.

Of course, a lot more investment needs to go into the area of lifelong learning in general, not least to avoid some of the simplistic assumptions about how easy it is to apply learning in new areas. But helping learners become lifelong assessors is a major new issue that is largely unexplored. It is, however, possible to discern a few signs of the elements we will need to take into account in generating sustainable assessment. I would like to briefly point out a few of these.

First, we now recognise that most of the learning we need over a working lifetime actually occurs in work after any initial education and training. Such learning is rarely formal and structured. We learn to do a job by doing it, by seeking help from peers and by checking our own performance. Supervisors have a role in identifying learning opportunities and monitoring quality, but there is now evidence that they have a lesser role in fostering learning and assessing performance than we once assumed. The major responsibility for learning and for assessing that learning lies with individuals and their peers. This is not a future development but a statement of the situation in almost all workplaces in Australia today. It is also, of course, true of the learning we do in our non-work lives as family members, participants in community or volunteer activities, in sport, etc.
Second, we already know that one of the key attributes of effective practitioners in any sphere is that they are good at identifying what is required of them, they can monitor their own performance and they know when they have achieved the desired outcome. They can do this without direct supervision, but with knowledge of the context in which they are working and in relationship with those they work with. They can benefit from the insights of others without being taught because they are on the lookout for cues about what constitutes good work and how they can improve what they do.

These attributes are exactly the ones that characterize good assessors. They are also the ones most learners in conventional programs are excluded from. There have been a small number of examples of introducing self and peer assessment activities during training or in courses, but these have been marginal and too often not built on carefully laid foundations so the assessments are made according to relatively uninformed and uninformative measures. Improving these activities and introducing them more consistently will be a useful step. But this is not the solution to the general problem of developing the capacity of learning-how-to-assess because the overall context of training continues to communicate that assessment is not really a realm for learners.

A much greater rethinking of the problem is required. Such a reappraisal will involve establishing, as a learning outcome for programs at all levels, the ability to learn that which is not given. That is, the ability to appraise the requirements for learning in a new area, to identify standards of good practice, to seek ways of using information available from physical and human resources, and to apply this to their own work. We can refer to this as people becoming active and deliberate agents in a learning network.

This appears to be an ambitious undertaking, and in some respects it is. However, it is what effective learners and effective practitioners do as part of their normal everyday activities. They have discovered that formal courses, whether in colleges or the workplace, have been poor at helping them develop these skills and they have consciously or unconsciously set about developing themselves in these areas. Informal learning has been used by them, by default, because of inadequacies in the ways courses are conceptualised and taught, not because learning informally is inherently better.
There are already many suggestions about potential contributions to realizing the ideals (and reality) of sustainable assessment: more focus on how learners recognise what constitutes good work, activities which require practicing in situations other than those in which learners were initially trained, cue spotting and interpretation, practice in self and peer assessment, etc. The first step is to recognise the need to fundamentally reconceptualise assessment as an issue and for us to place it sufficiently high on the agenda.

It needs to be given priority because good learning never finishes at the point of being assessed, but unfortunately traditional assessment ignores this — indeed, it implies that the learning task is over and the outside expert has deemed it satisfactory (or otherwise). Sustainable assessment, on the other hand, acknowledges that the learning just acquired is also the foundation for future learning and builds into all assessment tasks a focus on the longer term as well as the immediate. Assessment practices should be, in my view, designed on this basis and the quality of assessment judged in terms of its consequences in the workplace and for continuing learning. This way leads to a workforce that can regenerate its skills rather than being trapped by the very assessment of competencies that qualified it in the first place.

The first step is to recognise the need to fundamentally reconceptualise assessment as an issue and for us to place it sufficiently high on the agenda.
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disc one

Track 1 Introduction
   'Implicit Knowledge'
   Kirsner

Track 2 'Who are the Learners?'
   Rennie & Wyn

Track 3 'Emotions, Memory and Learning'
   Merson

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disc two

Track 1 'Aging Minds'
   Zubrick
   'The Learning Environment'
   Wills, Hedberg, Little & Oliver

Track 2 'The Real World of Work'
   Whyte

Track 3 'Assessment: Have we forgotten something?'
   Boud

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