

2008

IT'S ABOUT LEARNING

Some new and not-so-new challenges and insights for New Zealand school leaders in the 21st century

NASDAP Scholarship Report

This report brings together four issues relating to the leadership of learning which featured in the Harvard summer institute in school leadership attended by NASDAP Scholarship recipient, Shona Smith in July 2008.

They are:

- What really matters in schooling improvement?
- Making the learning robust – insights from cognitive and neuroscience
- Assessment for learning
- How emerging technologies can support 21st century learning.



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INTRODUCTION

The 2008 NASDAP Scholarship gave me the opportunity to attend a summer institute in school leadership from the 9th to the 18th of July at the Harvard Graduate School of Education in Cambridge, Massachusetts. The 138 participants were school leaders, mainly from the United States, but including others from Canada, Australia, New Zealand, South Africa, India and the Caribbean.

The institute, entitled *Leadership: An Evolving Vision*, was designed for experienced school leaders to revitalise their personal vision of leadership as well as refining their leadership and management skills in a highly interactive environment. The programme consisted of 66 formal hours of instruction as well as a considerable number of readings prior to and during the course. Most days consisted of plenary sessions followed by a period of reflection and follow-up discussion in smaller groups. The second day was spent in a team-building outdoor experience run by Project Adventure, which was highly successful in creating an atmosphere of challenge, trust and support within the groups.

The programme was a comprehensive, stimulating opportunity for professional growth, which enriched my understanding of school leadership in a number of areas. In many cases it provided affirmation of directions being taken in New Zealand and in particular at Waitakere College; in others it provided a challenge and some possible improvements we could be working on.

The time following the course has enabled me to explore some of these directions in more detail. Interestingly, this has often led me back to research generated within New Zealand, in particular, the best evidence syntheses (BES) on quality teaching for diverse students, on professional development and the forthcoming one on leadership as well as the recent work of Jane Gilbert of NZCER on new conceptions of knowledge and on the senior secondary school curriculum.

In this report I aim to share some insights which may be useful to other Deputy and Assistant Principals nation-wide, along with some of the challenges we face trying to prepare our 21st century students for an ever more complex and uncertain future. I will also be doing this with my colleagues and the Waitakere College Board of Trustees with a more particular focus on the needs of our students.

The questions I began with were very broad, but highly applicable to my own leadership interests and responsibilities and to the direction of our endeavours at Waitakere College.

- **How can school leaders improve the quality of teaching across a whole school in order to lift student achievement?**
- **How can we improve our leadership of initiatives to improve the quality of teaching and lift student achievement at Waitakere College?**

I have chosen to explore four main ideas which resonated strongly with me. References and contact details are provided to enable readers to follow these up in more detail if you wish.

FOUR BIG IDEAS (Chapters 1 to 4)

The four ideas are all closely related to learning. They are:

1. **School improvement – what really matters** *Pages 4 to 13*
Understanding the school context for school improvement – moving from the technical to the cultural (Richard Elmore)
2. **Making the learning robust** *Pages 14 to 24*
Important insights from cognitive and neuroscience(Kurt Fischer)
3. **Assessment for learning** *Pages 25 to 36*
The potential of in-the-moment and interim assessments. (Kim Marshall)
4. **How emerging technologies can support 21st century learning** *Pages 37 to 49*
Using emerging technologies to create situated learning (Chris Dede)

I have tried to structure this report so that busy Deputy and Assistant Principals can see at a glance the main ideas and explore those you find most relevant to your own school and circumstances. I have deliberately kept it simple and visual, but the report is based on a combination of the readings, the lectures themselves and my own follow-up investigation. If you wish to pursue an issue further, you will find references at the end of each chapter, along with a series of questions which you may wish to explore with your colleagues.

I hope this will prove a useful resource for my fellow NASDAP members. I am happy to respond to questions and can be contacted at sa@waitakere-college.school.nz



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September 2008

CHAPTER ONE

School improvement – what really matters?

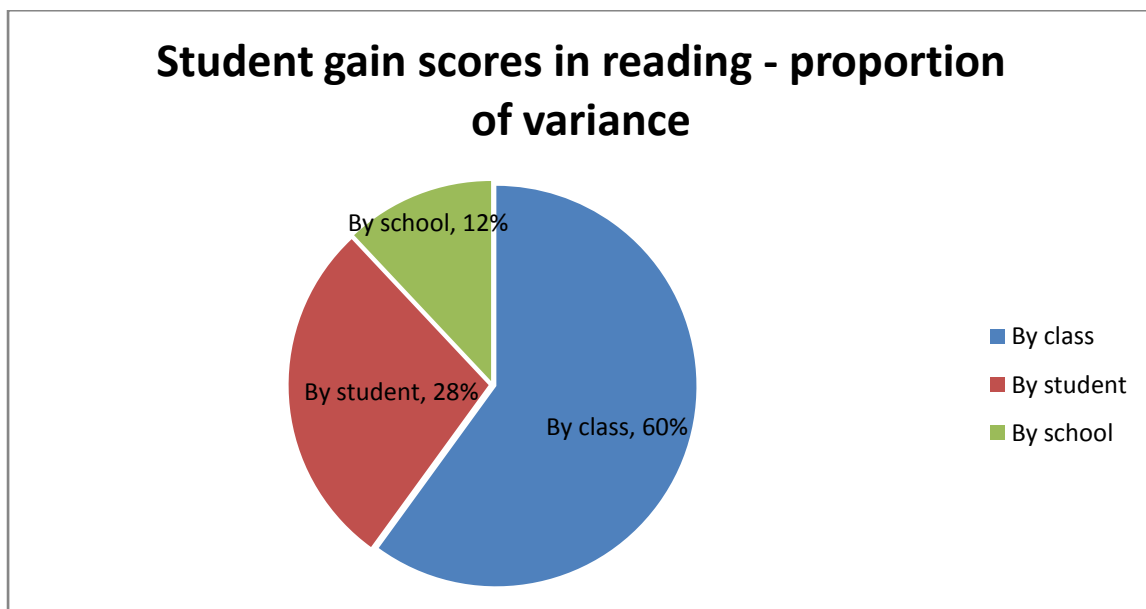
Understanding the school context for school improvement – moving from the technical to the cultural

Major source: Richard Elmore.

1. The central task of leadership – to reduce variance between classrooms by de-privatizing teaching

Elmore argues that a vital component of school improvement is to de-privatize teaching – to move away from the historic view in which “the core of education *‘what and how students are actually learning’* rests with individual teachers in isolated classrooms – a concept he calls ‘loose-coupling’. (Elmore R. i., 2008)

One of the most compelling examples he gives to show why this is important is illustrated in the graph below:



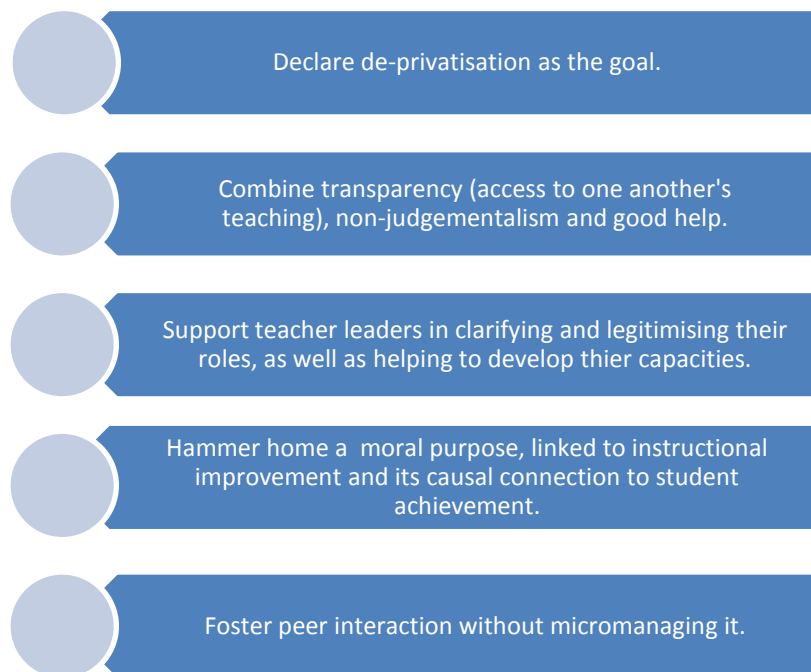
The graph shows much higher levels of variance between teachers than between schools or between students. The data for Maths revealed a similar pattern (Class 52-72%; Student 19%; School 10-30%)

Meaning – It matters 5-6 times as much which teacher you get as which school you go to. Consequently a major task of school leadership is to decrease the level of variability between classrooms in order to improve the quality of instruction for every student.

This is strongly supported by other school improvement literature. For instance Michael Fullan summarises research findings from 1981 till the present including Kruze, Louis and Bryk ‘s research on effective professional learning communities: “ reflective dialogue, de-privatization of practice, collective focus on student learning, collaboration and shared norms and values.” (Fullan, 2008, revised and updated second edition)P34.

Fullan places de-privatizing teaching at the head of his Six Guidelines For Principals and identifies it as “the biggest of the fights – to establish a culture in the teaching profession where it is normal and desirable for all teachers to observe and be observed teaching. The norm of privacy has withstood decades of attempts to change it.” (Fullan, pp. P51-2). This throws some light on the challenges faced by some New Zealand schools, including Waitakere College, as we implement the Te Kotahitanga professional development programme. To de-privatize teaching practice is to challenge a long-established culture of the autonomy of individual teachers – small wonder it meets some resistance along the way!

Figure 1 De-privatizing teaching - Fullan's starter list (Fullan, 2008, revised and updated second edition)



De-privatizing teaching also means being transparent about student achievement, not only at school level, but also at the level of individual teachers. Fullan comments on the power of assessment literacy – “the strategic use of data to improve teaching on a daily basis (assessment for learning) and the capacity to monitor results and engage the external accountability system.” (Fullan, p. P53) Some aspects of this topic will be discussed in Chapter 3.

2. Internal accountability :Achieving alignment between individual teachers and the collective vision

In the American context, Elmore points out tensions between externally imposed systems such as the test result based accountability systems of No Child Left Behind and district-based efforts for systemic improvement. (Elmore R. , 2008) We are comparatively fortunate in this regard in New Zealand at present, but the American example remains as a salient warning. Nevertheless, there are helpful insights for all schools everywhere in his analysis of what constitutes true internal accountability.

Elmore points out that all schools have concepts of accountability, whether or not they are explicit. He reports on a large scale accountability study which examined the variety of ways in which schools decide to whom they are accountable , for what and why in an essay entitled *When Accountability Knocks, Will Anyone Answer?* (Elmore R. e., 2004). The key questions explored with teachers were:

- To whom are you accountable in your daily teaching practice?
- How are you required to give an account of your actions?
- What are the consequences for failing to do so?

The default mode of accountability is closely related to the notion of teacher autonomy – in schools where there was no other system, accountability was atomised, resting solely on the individual sense of responsibility of each teacher. Other schools had achieved a culture where the collective expectations of the staff provided an informal internal system of accountability.

However, Elmore argues that in the effective schools in the study there was also a formal system to ensure that the agreed collective expectations are carried out. “In these schools, collective expectations gelled into highly interactive, relatively coherent, informal and formal systems by which teachers and administrators held each other accountable for their actions vis-a-vis students.” (Elmore R. e., 2004)

He represents this diagrammatically as an alignment between teachers’ individual sense of responsibility and the shared collective expectations, reinforced by a system of consequences for non-compliance.

Figure 2 Accountability



How was this achieved in the case study schools?

- High and explicit expectations influenced or worked in conjunction with teachers’ individual sense of responsibility;
- Recruitment interviews placed considerable emphasis on discovering how the teacher positioned themselves with regard to the school’s expectations;
- Leaders had ensured there were consequences (starting with support and professional development, right through to fronting up and making hard decisions) if teachers continued not to meet expectations.

The importance of teacher beliefs and expectations

Elmore argues that “the attitudes, values and beliefs of individual teachers, and administrators – about what students can do, about what they can expect of each other and about the relative influence of student, family, community and school on student learning – are key factors in determining the solutions that schools construct to the accountability problem.” (Elmore R. e., 2004)

This resonates with the emphasis placed on teacher positioning in the Te Kotahitanga programme or for that matter in any school which expects all teachers to commit to raising the achievement of all students. In a school where most or all staff have developed a shared belief that they can make a difference, it is not uncommon to hear teachers take their own colleagues to task for ‘deficit theorising’(*in other words, blaming students and their parents for their failure to achieve*) rather than relentlessly taking responsibility as a teacher for raising student achievement, even in difficult circumstances. This would appear to be a signal that teachers’ individual values are becoming increasingly aligned with the collective.

Conversely, the continued presence of deficit theorising is a reminder that when dealing with human beings perfect alignment is unlikely to be achieved. Achieving this state is not a simple task, nor is it ever really finished. It is part of the complex web of school improvement. A major task of leadership is to aim for “a strong normative environment inside the school, based on a belief in the capacity and efficacy of teachers and principals to influence student learning coupled with the knowledge and skills necessary to act on those beliefs...” (Elmore R. e., 2004)

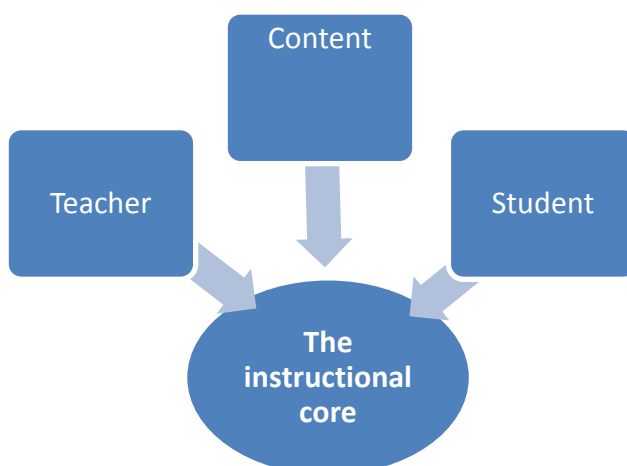
3. Focus on the academic tasks to improve performance

Elmore says there are “ basically only three ways you can increase learning and performance:

- increase the knowledge and skill of teachers.
- change the content
- alter the relationship of the student to the teacher and the content. “ (Elmore R. , The (only) three ways to improve performance in schools, 2008)

These he defines as ‘the instructional core’.

Figure 3 Points of entry for improvement of instruction



Academic tasks, he believes, define the real accountability system in your school. “The culture is present in the academic tasks students are asked to do. If you can’t see it in the instructional core, it’s not there.” (Elmore R. , Moving from the Technical to the Cultural: What's a leader to do?, 2008)

So for leaders to decrease the variability between classrooms, it is essential to focus on what is happening in classrooms, to ‘open the black box of instruction’. Leaders need to develop a deep understanding of instructional practice and be skilled at developing this in others. We need to be able to describe objectively what is happening in the classroom, then move to the analytical and inferential level, with questions such as these:

- a) What academic tasks are students being asked to perform?
- b) If you were successful in accomplishing the task, what would you know how to do?
- c) What is the student’s role in the instructional process?
- d) What do students have to know in order to gain access to the task?
- e) What do teachers have to know in order to provide access to the task for the students?

Schools need to develop a common language for classroom observations and to articulate the desired pedagogical approach. Not to do so means teachers receive what he describes as ‘very noisy advice’ ie confusing.

This is affirming of the direction taken by Te Kotahitanga schools, where teachers have had extensive professional development around the observation tool used and its rationale. In the case of Waitakere College we have developed our own complementary Effective Teacher Profile which now forms the basis for our professional development and performance review systems. In addition all subject Departments are currently reviewing all junior units to ensure that they meet school-wide expectations in terms of literacy, thinking skills and differentiation. One further development arising from Elmore’s work is to look at how to engender high quality conversations about the academic tasks themselves as part of our professional learning and accountability systems.

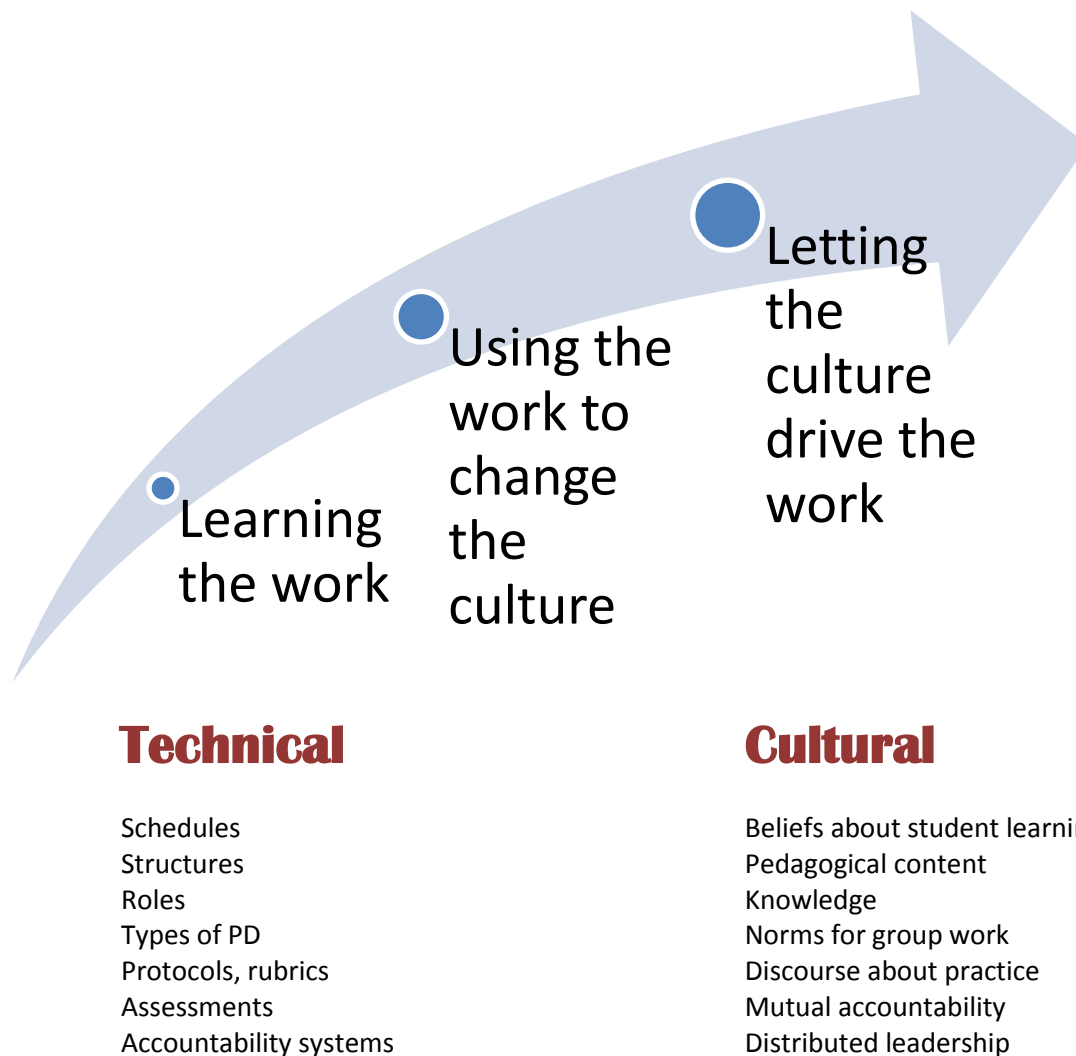
The role of the Principal (and in most cases other senior managers) is to model instructional leadership – the second of Fullan’s Guidelines for Principals. “Modelling instruction means centering the school’s mission around pedagogical improvements that result in student learning.” (Fullan, p. P53) Fullan also points to Viviane Robinson’s work which defines school leadership as “identifying what works and why”“it is the combination of description, practical examples and theoretical explanation that makes for powerful professional learning.” “The largest effect (more than twice as significant as any other) that Robinson found concerned ‘leadership that not only promotes, but directly participates with teachers in formal or informal professional learning.’” (Robinson, 2007) So we need to model instructional leadership ‘with precision and specificity’, (Fullan, p. P54)

4. The work of improvement: from technical to cultural

“Improvement, then, is change with direction, sustained over time, that moves entire systems, raising the average level of quality and performance while...decreasing the variation among units and engaging people in analysis and understanding of why some actions seem to work and others don't.” (Elmore R. i., 2008)

Elmore distinguishes between the technical and the cultural aspects of school improvement.

Figure 4 The work of improvement: from technical to cultural



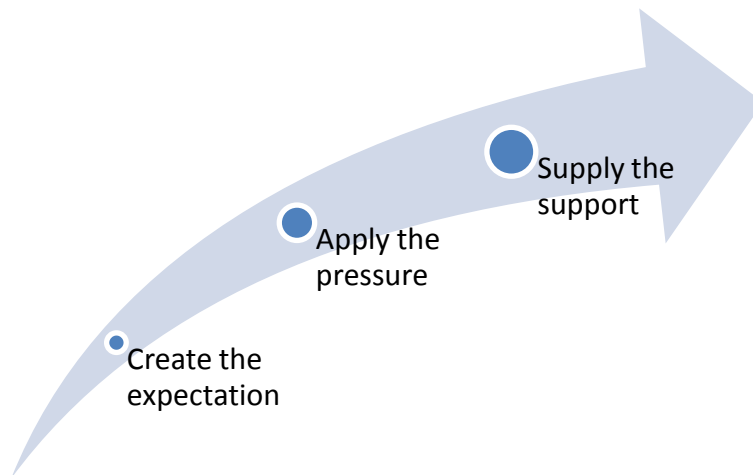
In the early stages of turning around an organisation it may be necessary to focus first on technical matters such as timetables, roles and structures. During this period leaders may find themselves getting respect for the wrong things – maybe because they are seen as taking a strong line on discipline or improving systems.

However it is vitally important for leaders to know where they want to get to with the culture. Any changes to the technical must be carefully designed to support the central purpose of improving instruction. This is the place for Fullan’s fifth guideline: Divert the Distractors! He recommends “taking an explicit proactive approach to managing the distractors... Take an inventory of operations, assign certain tasks to others and make some tasks low or nonpriorities.” (Fullan, p. P56)

“Leaders need to create a common culture of expectations regarding skills and knowledge, and hold individuals accountable for their contributions to the collective result.” (Elmore R. i., 2008)

Emotional intelligence is also central to successful leadership of change. We need to remember that school improvement usually means asking people to do something they don't yet know how to do. In the process of changing an institution people may go through the seven stages of grief and loss with as much intensity as for the loss of a person. For many teachers, de-privatization of their practice and transparency about assessment results would engender such a reaction. It is often not possible to make the changes without making unreasonable demands, but it is essential to ensure that the commensurate support is there as well.

Figure 5 Developmental processes



As the school begins to turn around we have to move more towards the cultural and do things differently. This means sharing power and distributing leadership, trusting that the newly developed culture is not entirely dependent on the willpower and charisma of a single heroic leader. Elmore notes that careful judgement is needed at this point – if leadership is distributed injudiciously before the culture is embedded things can snap right back to the way they were before!

The work in fact becomes more complicated. If a leader is not able to respond to the changes as the organisation develops they may not be the right person for Stage 3. Leaders need to have a trusted reference group who can help them grow along with the school.

Fullan offers capacity-building as a central element in improvement. "If you want to change teachers, don't lecture them with moral purpose. Show them and enable them to find the way.... Enabling the *how* is the key to forward movement." He also recommends growing new leaders , "not by distant delegation but by fostering coalescing leadership in which combinations of leaders are working together on instructional improvement." (Fullan, pp. P54-55)

"Perhaps the best way to view leadership is as a task of architecting organizational systems, teams and cultures - as establishing the conditions and preconditions for others to succeed." (Pfeffer & Sutton, 2006)

Comment

This work has led me to think about a number of questions with regard to my own school, including how to engender better conversations about the academic tasks, building strong internal accountability and exploring where we sit on the curve from technical to cultural.

For Deputy and Assistant Principals the question of how power is shared and leadership is distributed within our school is particularly pertinent. Are we ourselves afforded opportunities to lead and to grow professionally? What role do we play and our senior management colleagues in building capacity in others within our schools?

On the next page I offer some questions which may be helpful for senior management teams to explore or to share with staff.

Some questions we could ask about our own schools

Accountability – do we and all our teachers walk the talk?

- How well aligned are our teachers' individual beliefs about students and learning with our stated collective goals?
- How might we achieve closer alignment?
- How do we address the issue when teachers are not able or willing to work with and towards the school's collective goals?

How private is our teaching practice?

- Have we made de-privatization of teaching practice a goal?
- How do teachers in our school respond to being observed and observing others?
- How do teachers in our school know what we mean by good practice? Do we have a common language to describe it?
- What practices do we have to help teachers and senior managers observe each other, seek to identify, copy and develop good practice?

How well do we focus on the academic tasks?

- What practices do we have to bring about thoughtful conversations about the nature and quality of academic tasks and teaching practice?

Moving from technical to cultural?

- Where does our school currently sit on the curve from technical to cultural?
- Do our technical/structural/organisational systems support the culture we are trying to create?
- How is leadership (formal and informal) distributed within our school?
- How do we build capacity in order to grow the next generation of leaders within our school?

The major source of ideas for this chapter was

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Check web-site:
Usable Knowledge
www.uknow.gse.harvard.edu
Has relevant articles, interviews and videos from Richard and other
Harvard GSE staff.

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CHAPTER TWO

The brain and robust learning –insights from cognitive and neuroscience

Major source: Kurt Fischer

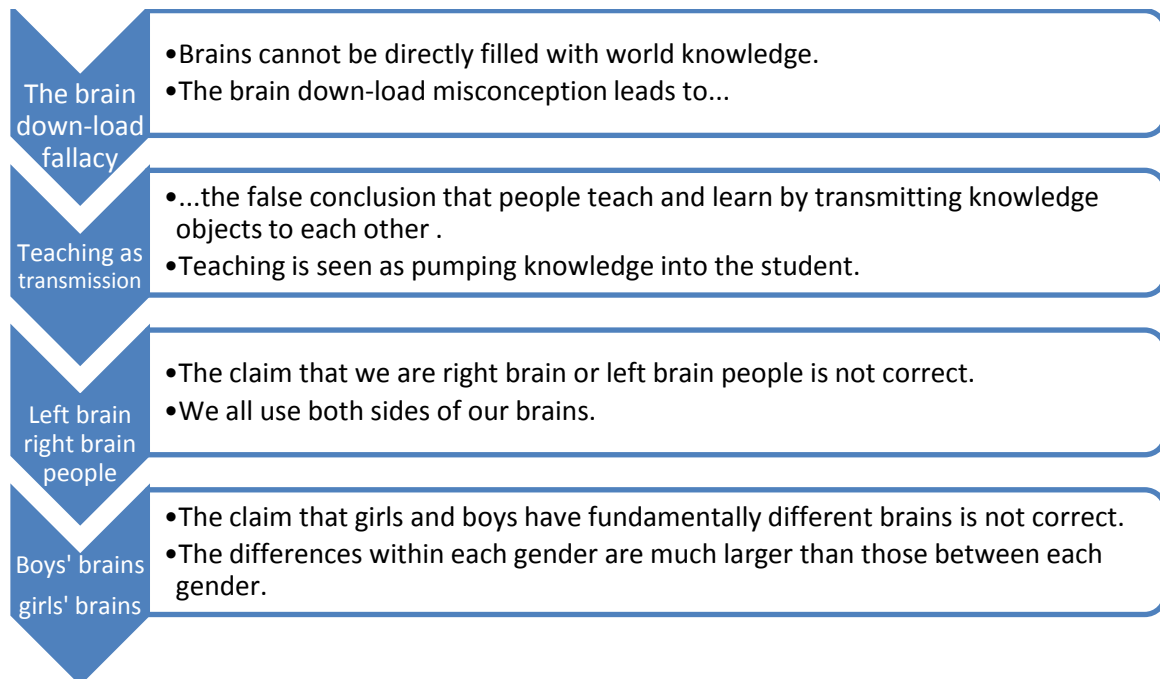
Professor Kurt Fischer is a leader in the new field of Mind, Brain and Education, who has founded an international society which brings together cognitive and neuroscientists and educators. He has a vision of “a reciprocal relationship between research and practice, analogous to the relationships between biology and medicine”. He envisages research schools for education which would play a role similar to that of teaching hospitals, “where researchers and practitioners work together to carry out research that is relevant to practice and train young professionals.” (Fischer & interviewed by Hinton, 2008)

Fischer points out that whereas schools were once considered effective if they had a significant impact on 25% of their students, now we are expected to succeed with everybody. The purpose of the Mind, Brain Education movement (MBE) is to support this purpose. His presentation showed clearly how new knowledge from brain science can give us a scientific underpinning for theory and practice about learning. Harvard’s Usable Knowledge web-site <http://www.uknow.gse.harvard.edu> is a useful source for future updates in this fast moving area.

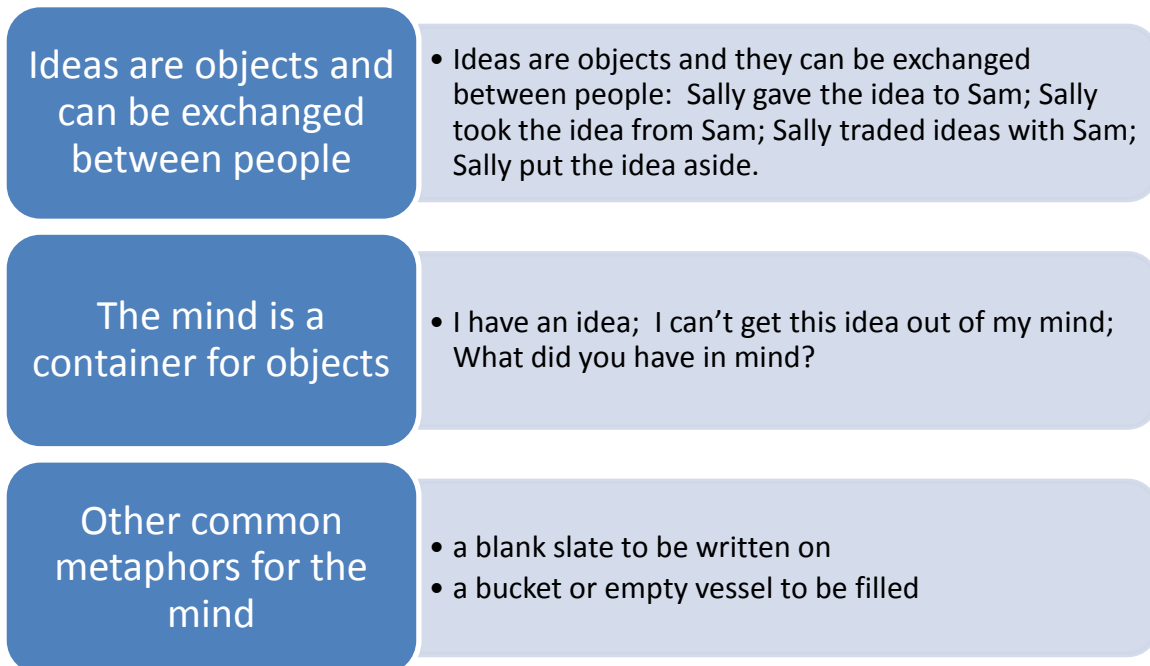
1. Brain scams: Illegitimate claims from neuroscience

Fischer points out that misleading claims about the brain are often made on a supposedly scientific basis. These simplistic biological or genetic attempts to explain how the brain works have had a powerful influence on the way we approach teaching and learning.

Figure 6 Illegitimate claims from neuroscience



Fischer also argues that our culture has some pervasive metaphors about the brain which are unhelpful for our understanding of how students learn. These are variations on the theme of knowledge as objects that we give to each other.



In teaching, this has led to the transmission model, where we treat students as disembodied brains into which we pump knowledge.

2. A better model – grasping and feeling with the mind

A better model is to see intelligence, knowing and feeling as active; we need metaphors of grasping and feeling with the mind, actively adapting and structuring experience into understanding. Fischer points out that this is literally correct in terms of brain activity – whenever neurons fire in a region of the brain, they create brain waves of electrical energy, mainly cortical, which can be measured using EEG (electroencephalogram) technology. There is a direct relationship between the amount of brain activity and the learning taking place, which can be seen in EEGs.

Children's brains are typically more active than adults because they are in the process of learning new things, that is, growing new neural pathways. Adults' brains have become more efficient in areas where learning has already taken place, so less brain energy is needed. Some synapses have been pruned because we didn't need them in early life. This can be a disadvantage in some areas such as learning languages later in life, although it is not insurmountable, because the brain can regrow or find new pathways. However, we have all experienced situations as adults when we are learning something new, where our brains are once again having to expend more energy.

This connects with Jane Gilbert's Knowledge Wave work, where she describes the shift from the historical view of *knowledge* as a noun to the 21st century verb, *to know*. Most recently she has developed this understanding along with Rachel Bolstad in their thought-provoking look at the senior secondary school curriculum, *Disciplining and Drafting, or 21st century learning*:

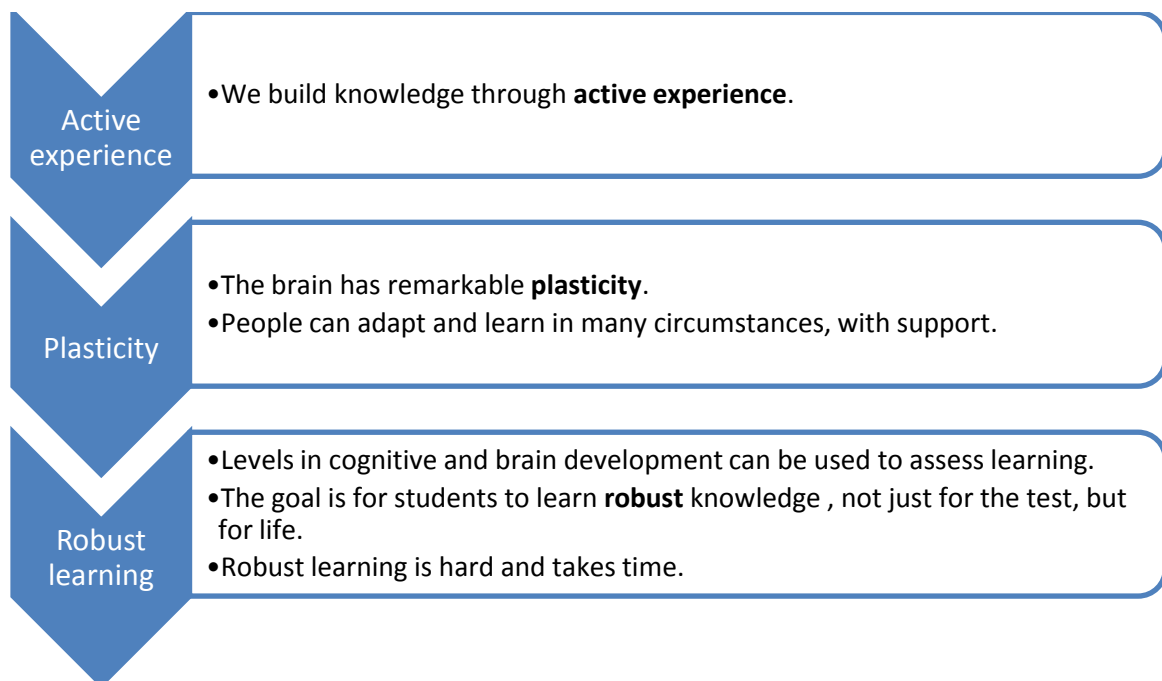
"Knowledge Age economies rely not on extracting natural resources for use in manufacturing, but on *ideas*. However, knowledge in this context does *not* mean 'stuff' that people 'get' and store away. It has a new meaning, one that differs in major ways from the one that underpins our education system. Knowledge, in the Knowledge Age *does* things; it makes things *happen*. As one commentator put it, knowledge is no longer thought of as if it were a kind of matter: instead, it is seen as being more like energy." (Bolstad & Gilbert, 2008)

This presents us all with a serious challenge as we rethink the senior secondary school in the light of the key competencies and the new curriculum. It goes well beyond the scope of this report, but will undoubtedly help to inform ongoing discussions in my own school and others throughout New Zealand.

3. Legitimate educational principles from cognitive and neuroscience

Fischer outlines the following principles which have major implications for educators.

Figure 7 Legitimate educational principles from cognitive and neuroscience



Teachers need to understand that **knowledge is not simply transmitted: each person builds it anew**. Our role as teachers is to provide the optimum conditions for each learner to build their understanding and to recognise that different students will find different pathways to the learning. This calls on all our pedagogical skills to build relationships with students, help them access their prior learning to find ways into the new learning, plan appropriate strategies and interactions, assess in-the-moment to discover individual learning difficulties and give academic feedback and feedforward to help each student get over the blocks and make progress.

Because knowledge is active, not an object, we need to be clear that robust learning involves **understanding concepts, not just memorising facts**. Where teachers still see learning facts as the primary goal, robust learning is unlikely to occur. Getting through the necessary content can obscure the pointlessness of doing so at the expense of understanding. In secondary schools we are often under pressure to move on to the next topic in order to ‘cover the curriculum’ and prepare students for external qualifications. But if we do this without ensuring that the concepts have been understood, the outcomes are counter-productive, even in terms of the limited goal of exam success.

This supports the direction of the schools which are working to introduce the explicit teaching of thinking skills and calls to mind the excellent analysis of NCEA examiners’ reports done by Cheryl Harvey and Jennifer Glenn of Team Solutions. This shows very clearly the literacy and thinking skills which are required in most cases even to achieve the standard and the higher order skills which are prerequisites for merit and excellence grades. (Harvey & Glenn, NCEA Analysis for Teaching and Learning, 2007)

We need to recognise that **robust learning is slow and hard**. Teachers may believe that students have learned something because we have taught it. Students may have been able to perform at an optimum level once or twice when the teacher provided the ideal context and personal support. They may even be able to perform well in an initial test. However, it takes a lot of time and practice for learners to fully grasp new concepts and be able to use them in unfamiliar contexts, let alone for life.

We should also be aware that **knowledge is not static**, even once robust learning has taken place. It is natural for people to fall back from a peak of understanding if the knowledge is not used. In that sense the brain can be seen as similar to a muscle; it needs training and practice to stay fit. Teachers need to be cognisant of this when students are being expected to use previously mastered skills and understandings after a long gap. The impact of the long summer break is a case in point!

These principles are not new to me as an English teacher, nor, I am sure to many others. However, in the past, good teachers had to stumble onto them or discover them through more qualitative forms of educational research. What Fischer’s research adds is a scientific basis for many of the principles which have underpinned truly good pedagogy. Further, it presents a very strong challenge to teachers and schools still stuck in a culture which focuses primarily on content and testing, or where failure is largely attributed to deficits in the students and their families.

4. The power of plasticity

Fischer illustrates the remarkable plasticity of brain development and learning through examples of what can be achieved by children with who have had serious brain surgery. He gives evidence of two boys who each had half of their brain removed in infancy:

Nico, a true left hemisphere person, is cognitively normal at age 17, performing above average in school, with many friends. He learned to draw and also to use the melody of speech and plays sport.

Brooke learned to speak with no left hemisphere and is also coping well at school.

Both boys' brains had managed to adapt and find different ways to learn the skills they needed.

The point he is making is that we cannot prejudge what an individual will achieve. In the cases of serious brain injury we cannot be sure that all the skills will be regained, but we can be sure that if we don't try, they definitely won't!

"The message is that in a supportive environment kids learn to do the important things with whatever capacities they possess.

The skills seem to be the same, but kids learn them through different processes. This is robust learning, not just learning for the test." (Fischer, *Brain Scams, Myths and Knowledge about the Brain and Learning*, 2008)

Another group who reveal considerable plasticity are dyslexic individuals. This is another area where scientists are making progress. Learning disabilities are part of the normal distribution of abilities within the human race. Dyslexia is not a single specific disorder in the brain; rather there are many different genetic loci which bring about learning difficulties. The condition of dyslexia is highly heritable. However, environmental influences can strongly shape the abilities and disabilities of a person with dyslexia.

Rosalie Fink's study of highly successful adults who are severely dyslexic shows how these people found their own pathways to reading (Fink, *Promoting Success With An Interest-Based Model Of Reading*). Fischer cited the case of a boy who was finally switched on to reading when his parents took the advice of a wise teacher to let him follow his passions and read the lawnmower manual! There is also interesting new research on the visual talents of dyslexic scientists which has revealed that some dyslexics have fewer cells in the centre(fovea) of their retina and more in the periphery. This is a disadvantage for reading, but an advantage for some kinds of skills such as scanning wide fields and detecting patterns – hence dyslexia may be a plus for an astrophysicist or an artist.

Most dyslexics and other students with learning disabilities are relatively normal cognitively. The spread of abilities reflects the normal range within the human population.

The lesson for us as teachers is to have faith that all children can learn, and to remember that different students may need support to find their own pathways. For some students with disabilities simple drilling and repetition may help them overcome a particular hurdle or learn a particular skill. **However, the most important thing is for teachers to focus on the student's strengths and work out how to use that strength to support the next phase of learning.**

" Teachers who try to find out what children do not know (and much testing is directed to this) are looking for initial points of contact in the wrong places. What they need to do is find points of contact in a child's prior learning, the things that children can do, and spend a little time helping children firm up their grasp of what they already do know." (Clay, 1998)

5. Understanding growth cycles of brain and mind– a tool for assessing learning

The Mind Brain Education movement has also created a scale for assessing the development of skills based on empirical data about how the brain develops in relation to learning. This provides a more helpful picture of how learning occurs than the simplistic notion of a ladder of development. In fact **learning and development is much more like a web, with many separate strands** (including the different domains or learning areas, individual abilities, and neural pathways). **It occurs in spurts, there are sometimes plateaus and it sometimes goes backwards.**

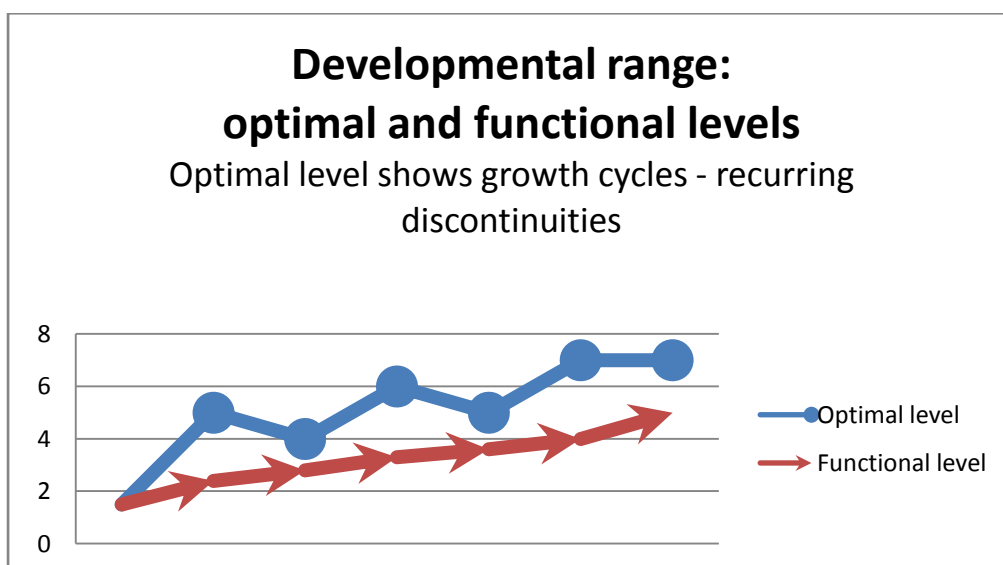
EEGs reveal that the brain has observable spurts of growth , when there is more electrical activity in the cortex and stronger connections between its parts. Fischer noticed that “these occur at the same time as new skills emerge, say in musical performance or spatial reasoning. “ (Fischer & interviewer Fusaro, What's the brain got to do with it?, 2008) There are identifiable spurts around ages 2,4,10 and 15, continuing up to the age of 25.

Interestingly there are even head circumference spurts at age 4, which coincide with increased brain activity, when children have a spurt in understanding numbers, classifying things and using complex sentences. Four year olds often begin to develop a ‘theory of mind’ as the relationships with parents begin to change and many begin to learn to read.

Between 14 and 16 there are concurrent changes in arithmetic concepts, the ability to make reflective judgements, view of oneself in relationships and EEG activity growth.

There is a universal developmental scale for all domains (e.g. reading, mathematics, science) , but each domain develops largely independently. Development in all areas involves a recurring growth cycle as the student relearns skills and concepts at successively more mature levels. Vocabulary growth , for example , often involves a slow build-up, with little evidence of progress, followed by a sudden burst of new language acquisition – these occur repeatedly, up to around the age of 25.

The developmental range – optimal and functional levels



It is helpful to distinguish between **the optimal and functional levels** at which a learner performs during the developmental range.

Optimal – the best performance a student can give with support.

Functional – what the student can do independently without help from context or learners. (moving from novice to expert)

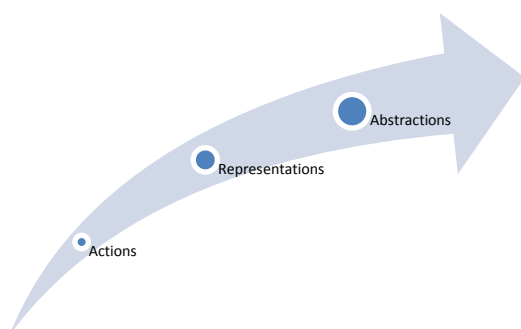
Students will achieve their optimal performance when the teacher provides support such as a familiar context, or ways to access prior knowledge, or prompts through questioning. Optimal performance will develop in stages, with periodic lapses back to the functional level. The functional level shows what the student can achieve without any help. This develops over a much longer period of time, just a steady rise, without stages, providing the support and practice continues. If the support is removed too soon the student will quickly revert to the functional level.

Skilled teachers understand this and provide ongoing support and opportunities for practice over a period of time. The long term goal is for the functional level to come up to the formerly optimal level of performance. When the learner is doing this most of the time, the learning is now robust and the cycle can begin again.

The main message for teachers is not to remove the support too soon and to give students plenty of practice in order to make the learning robust. Sustaining the highest level of performance supported by brain development takes support and help from others.

Fischer identifies different skill levels that reorganize behaviour and neural networks :

Figure 8 Skill levels that reorganize behaviour and neural networks



This is the basis of the new scale developed by MBE for the assessment of learning, which shows the approximate ages at which cognitive development occurs, matched with concurrent brain growth spurts.

Ages of emergence of optimal and functional levels

Level	Optimal	Functional
RP1 Single representations	2	2-5 yrs
RP2 Representational mappings	4	4-8
RP3 Representational systems	6	7-12
AB1 Single abstractions	10	13-20
AB2 Abstract mappings	15	17 – 30
AB3 Abstract systems	20	23-40 or never for many domains
AB4 Systems of abstract systems = principles	25	30-45 or never for many domains

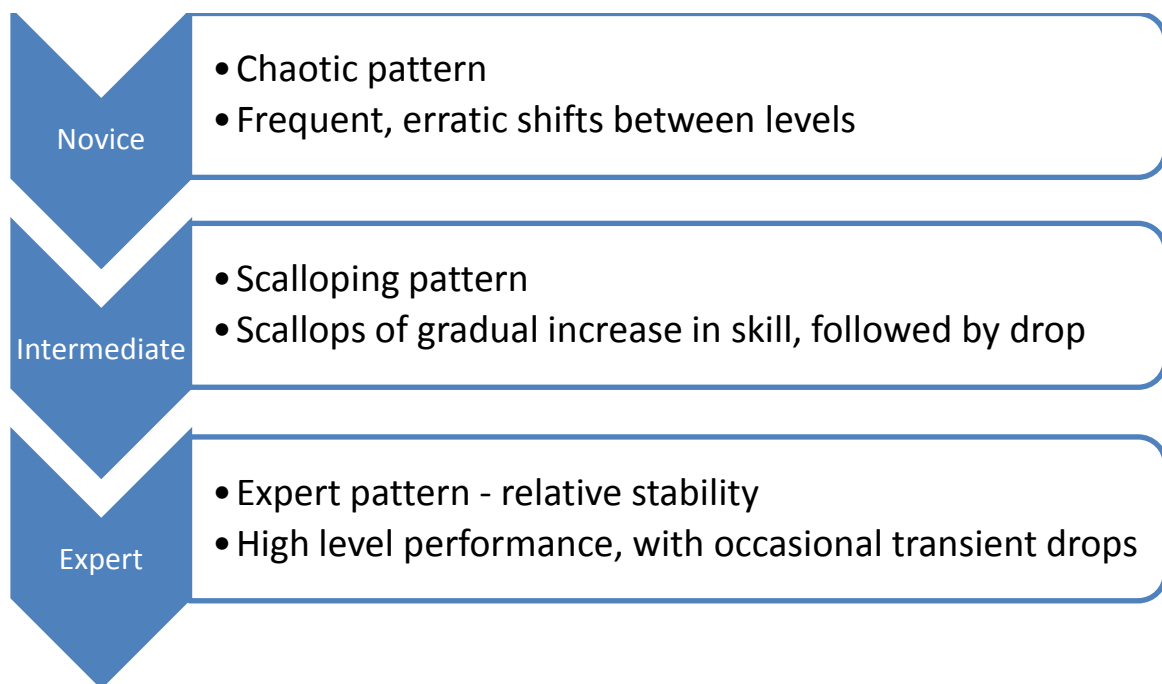
Ages for functional levels vary widely and are coarse estimates, based on research by Fischer et al – levels highly related to education.

Fischer's research is exploring how this scale can be used:

- to assess concepts, skills, learning across domains
- for planning curriculum materials
- for assessing teaching skill
- for tracing students' building general knowledge, which is slow and hard

Research shows that the patterns produced by EEGs are matched by the pattern of performance measured on this scale as students move from novice through intermediate stages towards becoming experts. Novices make occasional forays into the level of representations, but slip back frequently to the actions level. Intermediate learners show a scalloping pattern, moving more often into the higher tiers of representation with a gradual increase in skill, but dropping back. Experts have moved more securely into the higher tier of representation with occasional drops to the lower level of representation.

Figure 9 Growth curve pattern as students learn concepts and skills



Teachers need to be aware of what learning patterns look like in order to understand where students have got to in the learning process.

"As part of this variability, student progress and regress in dynamic, web-like pathways to learn and generalize knowledge. They do not linearly build knowledge like moving up steps of a ladder, but repeatedly fall back to lower levels as they build up skills that can generalize across tasks and concepts. Especially when a challenging concept relies on an embedded simpler concept, students must revisit the earlier, simpler concept repeatedly to reconstruct a more complex understanding. Designing learning environments that provide opportunities for students to revisit their earlier knowledge in structured ways can facilitate automatization and generalization, allowing students to focus on different aspects or implications of the problem or solution and thus to extend their understanding to broader contexts." (Fischer & Immordino-Yang, *Cognitive Development and Education: From Dynamic General Structure to Specific Learning and Teaching*, 2002)

Comment

Fischer's work in the area of assessment is at an early stage and in my estimation needs refinement before it can easily be used by classroom teachers. He is currently collaborating with teachers on several related projects, so future developments are likely to be interesting.

However, his explanation of how learning happens is enlightening and an understanding of this would be immensely helpful for every teacher. For me, his work affirms much of what I have learned over the years as an English teacher, giving the scientific basis for the pedagogical approach I have learned from a mixture of experience and theory. The focus on active intelligence, on *knowing as a verb*, on learning through active experience links well with the new curriculum and the key competencies. The evidence of the remarkable plasticity of the brain absolutely confirms the need for us to have high expectations of all students, as well as developing the relationships which will enable us to help students find their individual pathways to learning.

The information about the patterns of development explain why it is so difficult to ensure that deep learning takes place, but also gives valuable guidance on how to promote robust learning – in essence, through personalised support and practice. And as he refines his work on assessment this may also help us see what cognitive levels our students have reached.

My personal 'takeaway' from Fischer has been to think harder about how we can ensure that the learning in our school is robust.

Overleaf are some questions you may find useful to consider in your school.

Some questions we could explore in our own schools

What do we know about the brain?

- Try a discussion based around the myths which Fischer debunks. Ask people to describe or sketch a metaphor for teaching and learning. Get people to share these and discuss them. Introduce the concept of knowing as a verb, an active intelligence.
- Share some information about the plasticity of the brain and get people to consider how this fits with their view of teaching. This may bring out cognitive dissonances if some teachers believe that some students have genetically determined limitations.

How active is the learning in our school?

- Get teachers to analyse what they taught in the last week. How much was about learning facts and how much was about learning concepts?
- Are students in our school consumers of knowledge or do they get a chance to create knowledge? How? How often?
- How could we make the learning in our school more active and engaging?

How robust is the learning in our school?

- Introduce the concept of robust learning and ask teachers to think about how robust the learning is in their classrooms.
- Then ask teachers to think about how to go about making the learning robust.
- Introduce the idea of moving from novice to expert and ask teachers to devise a way of assessing where students are in the development curve.

The major source of ideas for this chapter was

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Check web-site:
Usable Knowledge
www.uknow.gse.harvard.edu
Has relevant articles and videos from Kurt and other Harvard GSE staff.

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CHAPTER THREE

Assessment for learning – the potential of in-the-moment and interim assessments

Major source: Kim Marshall

Kim Marshall provides a compelling reminder of why teachers need to be skilled in using formative assessment to support learning. He gives the rationale for both in-the-moment and interim assessments and advocates the carefully judged use of interim assessments as a valuable tool for school leaders to feed back into the ongoing process of formative assessment.

1. The urgency of improving teaching to address the achievement gap

"It is teachers that make the difference." (Hattie, 2002)

We know from decades of research that the most important factor in improving student achievement is effective teaching – also that it makes the greatest difference to low achievers. Marshall gave evidence to show how mediocre teaching is a gap-widener. Hence school leaders need to focus on finding ways to improve teaching.

This echoes Elmore's message about the need to decrease variance between classrooms and Fullan's about de-privatizing classroom teaching. It is also strongly supported by the findings of the Ministry of Education's Best Evidence synthesis on Quality Teaching for Diverse Students in Schooling, for instance:

59% or more of variance in student performance has been shown to be because of the teacher;

21% or less of variance in student performance has been linked to school level variables. (Alton-Lee, Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis, 2003)

Marshall argues that school leaders need to focus on the best, most research-based theories of action and identifies the following strategies as the most powerful:

- Teacher teams backwards planning curriculum units together
- Teachers using in-the-moment assessments to fine-tune teaching
- Teacher teams looking at interim assessment results and student work
- Instructional coaches observing and coaching/mentoring teachers, teams.

Marshall poses a typical classroom situation, in which a teacher has taught a topic and given an assessment in which about half the class achieve proficiency or better and asks, what generally happens next. In most cases, the teacher records the results and moves on to the next topic! The system in fact conspires against teachers using assessment information as data to improve learning, given the pressure to move on regardless of results. This is a powerful force even in elementary and middle schools in the American context where 8 year olds and their teachers are subject to a misguided regime of external testing under the guise of *No Child Left Behind*. In New Zealand the pressure to 'get through the curriculum' is most evident at secondary school level.

Yet, if the teacher moves on without addressing the issues of confusion or misunderstanding for those who didn't achieve, the gap widens and classrooms become "engines of inequality". (Marshall, *Effective Use of Interim Assessments to Close the Achievement Gap*, 2008)

2. Assessment for learning – what's new?

"It's all about constantly checking for understanding, fixing learning problems. This is what highly effective teachers do... immediately intervening when kids are confused and failing to understand. But it's hard to orchestrate. Let's dig in!

To pull this off, we need four things:

A belief that it's the school's mission to get all students to proficiency

Good during the year assessments

Immediate analysis and follow-up

Understanding of the process so it doesn't get screwed up." (Marshall, *Effective Use of Interim Assessments to Close the Achievement Gap*, 2008)

Marshall makes a powerful case for formative assessment, but this in itself is not new to New Zealand school leaders, especially those who have been involved in Assess to Learn (ATOL) projects. Te Kete Ipurangi's assessment web-page provides ample evidence of research findings as well as practical resources for professional development in assessment for learning. (New Zealand Ministry of Education, 2008) At least 6 of the 10 key characteristics of quality teaching for diverse students identified in the BES relate in some way to the need for teachers to be skilled in using assessment to support learning:

- "Focus on student achievement and high standards of student outcomes
- Effective linksbetween school and other cultural contexts...
- Is responsive to student learning processes
- ...appropriate feedback on students' task engagement
- Promotes learning orientations, student self-regulation, metacognitive strategies and thoughtful student discourse
- Teachers and students engaging constructively in goal oriented assessment." (Alton-Lee, *Quality Teaching and the Implications for Teaching and Learning*, 2003)

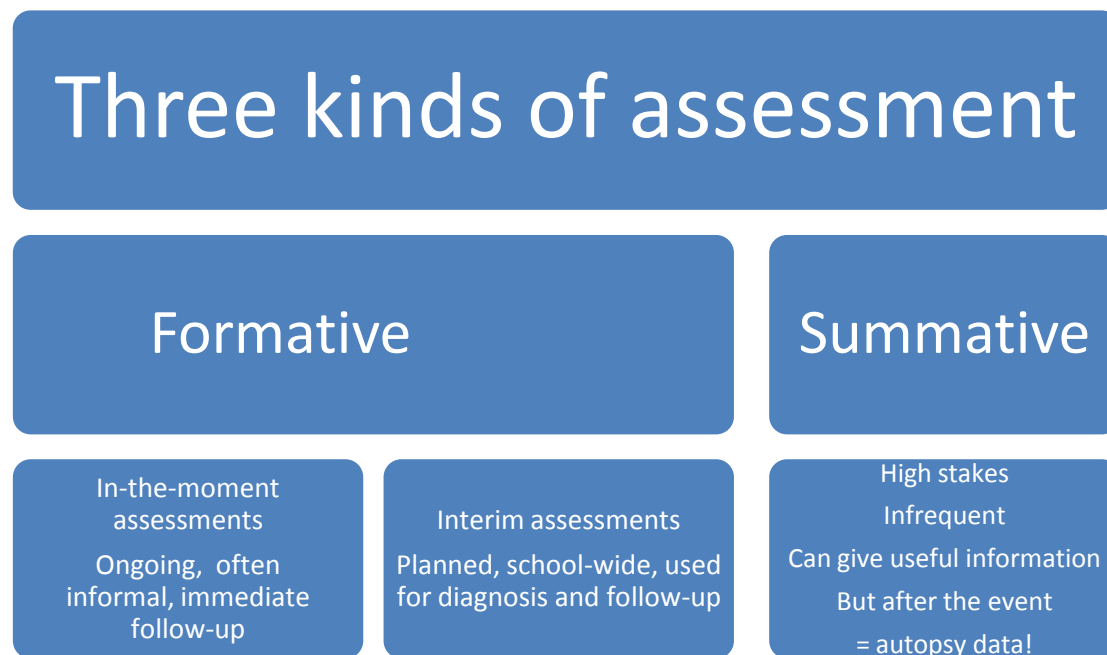
Te Kotahitanga's culturally responsive pedagogy of relations also places powerful emphasis on the importance of academic feedback and feedforward.

Knowing about it is not the same as making it happen in every classroom, and this is still a major challenge for many schools.

However, Marshall takes a somewhat different approach in his advocacy of the use of interim assessments for formative purposes as a leadership tool which can feed back into in-the-moment assessment within professional learning communities.

3. In-the-moment assessments

He distinguishes between in-the-moment and interim assessments thus:



In -the- moment assessments

Marshall defines in-the moment assessments as “teachers checking for student understanding, minute by minute, day by day ” and using this to promote learning. (Marshall, Interim Assessments: Keys to Successful Implementation, 2006)

Examples include:

- Quick checks for understanding
- Dry-erase boards, flash-time, clickers
- Exit cards, Cold-calling
- Journal writing
- Quizzes (checked quickly, followed up)
- Homework (ditto)

“These kinds of assessments provide a window into the minds of learners by answering the teacher’s perpetual question: What is the next instructional move?” (Fisher & Frey, 2007)

Black et al would add other formative approaches including the following:

- Questioning: asking worthwhile questions; increasing wait time; rich follow-up activities which extend understanding.
- Feedback and forward: Improving the quality of written and oral feedback so that it causes thinking to take place.
- Peer and self assessment: making the assessment criteria transparent; teaching students the skills of collaboration in peer assessment, encouraging students to assess their own progress in relation to goals. (Black, Harrison, Lee, Marshall, & Wiliam, September 2004)

The common threads running through all these strategies are the teacher's focus on understanding more precisely where students have got to on their learning pathways in order to help them move on and the expectation that students will become active participants in their own learning.

Incidentally, Marshall used a great resource - a section from the Film Man on Fire where the black chauffeur Creasey begins to coach a young white swimmer – to illustrate in-the-moment assessment in operation.

Ways to screw up in-the-moment assessments

Marshall points to a number of ways in which these strategies can fail, where teachers have not fully grasped their purpose.

- Minimal or low level questions
- Meaningless checks for understanding (Is everyone with me?)
- The COPWAKTA syndrome – calling on people who already know the answer
- Quizzes not assessed at all or treated as summative
- Negative feedback related to ability rather than understanding.

Williams' Principles for teams doing in-the-moment assessments

- Gradualism – take it slow, a little at a time
- Flexibility – what works in one situation may not work in another
- Choice – teachers decide which kind to adopt
- A focus on results – teachers are free to choose, but is the chosen approach working?
- Support – teacher team meetings go beyond polite serial turn-taking and get to the heart of the matter as equals (no “experts”). (Black, Harrison, Lee, Marshall, & Wiliam, September 2004)

This is broadly consistent with the findings of the BES on Teacher Professional Learning and Development , which identified that “the use of formative assessment in feedback is effective when it can answer three questions for the learner: **Where am I going? How am I going? And Where to next?**” (Timperley, Wilson, Barrar, & Fung, 2007, pp. 183-192).

These questions apply not only to the students but also to their teachers as they grapple with new professional learning. The study points out that the use of assessment for learning can be an extremely powerful component of professional development in terms of impacting on student outcomes. However, the teachers need to understand the purpose of any new learning and have deep knowledge of how students learn in that curriculum area so that they can interpret the assessment information and work out appropriate teaching and learning strategies. Not only that, but the professional learning needs to have engaged the teachers in debate , challenge and reflection on their own theory of practice in a way that motivates them to be open to professional growth. (Timperley, Wilson, Barrar, & Fung, 2007, pp. 183 - 192; 196-201)

Professional development in assessment for learning will continue to be an important priority for many New Zealand schools for some time until we have succeeded in learning how to build these approaches into our classrooms, ‘day by day and minute by minute’. The BES provides powerful research based principles to underpin professional learning in this as in other areas.

4. Interim assessments

William argues in-the-moment assessment is all that is necessary, but Marshall takes the view that interim assessments are another powerful tool in raising student achievement. **By interim assessments he means essentially the formative use of quasi-summative assessments. These are formal but low-stakes school-wide assessments which are assessed and analysed with a speedy turn-around time in order to feed back quickly into planning and follow-up teaching.** The process he recommends is set out in Figure 1 on the next page.

The version of interim assessments Marshall describes is set in the American context of state-wide testing – hence it is necessary to think beyond this context in exploring how interim assessments might be used in a New Zealand setting. The asterisks in Figure 1 signal areas of actual or likely difference.

Interim assessments – the rationale

One of the advantages of interim testing from the American perspective is that public data gets everyone on same page curriculum-wise. This is a huge issue in the USA given the absence of a national curriculum and the variety even within states. It is much less significant in New Zealand given our history of national curriculum and qualifications structures.

State-wide testing in middle schools also creates pressure for interim assessments to be used as practice tests, to boost students' familiarity with test formats. This is perhaps what drives the recommended frequency of interim testing every 4-9 weeks. In New Zealand secondary schools this would almost certainly be seen as overkill, leaving insufficient time for teaching and in-the-moment assessment.

He also claims that the formality and rigour of school-wide assessments encourages students to take these seriously. Secondary teachers might query this conclusion given our experiences of students' attitude to in-school exams, although school climate can undoubtedly have an impact on how students approach these assessments.

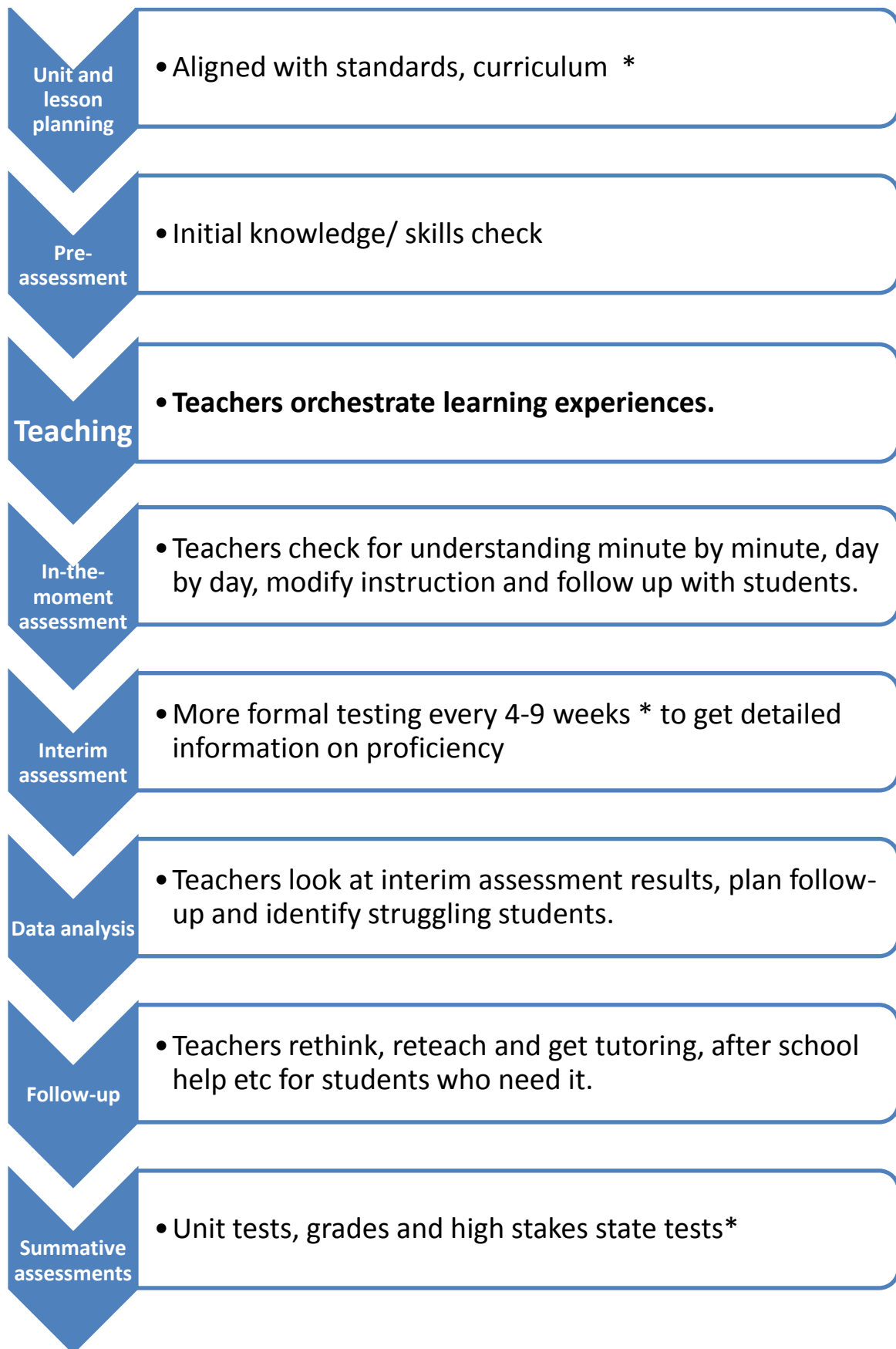
However, most of the other reasons he gives could have relevance in the New Zealand secondary school setting. He argues that because this data is public within the school:

- it makes possible a thorough analysis of what students understood or were confused about;
- it can be discussed with colleagues, with collective energy going into finding solutions
- it is visible to senior managers, who thus have more insight and opportunity to work with teachers on finding solutions
- it allows for more systematic intervention with struggling students.

None of this is a reason not to focus on developing teachers' skills with in-the-moment assessment. However, this form of assessment is so individual and ephemeral that it is difficult for school leaders to know in detail what is happening or to be aware of whether the desired progress with student achievement is taking place until the summative assessment (by which time it has become "autopsy data"). Interim assessments, provided they are carefully thought through, may offer a window into progress once or twice a year, in order to better inform the next stage of teaching and learning.

Figure 10 Interim assessment process (Kim Marshall, 2008)

*Asterisks inserted by Shona Smith to signal differences between USA and New Zealand contexts



Professional Learning Communities

The process Marshall outlines is based on establishing a culture of continuous improvement and involving teachers in a professional learning community, which he describes as follows:

- Teachers (same subject, or with a coach or senior manager)
- Focused on common learning expectations
- Giving frequent common interim assessments
- Analysing what students learned, didn't learn
- Re-teaching, improving how it's taught
- Following up with students who are struggling
- Constantly fine-tuning teaching
- Refusing to let students fail

He notes that we have a lot to learn from athletics coaches, music and drama teachers , who have always used in the moment and interim assessments, constantly gathering formative data and motivating students towards continuous improvement, with the game or the performance as the summative event.

The professional learning community he advocates has much in common with New Zealand communities which have developed through programmes such as Te Kotahitanga, Assess to Learn and Literacy projects. The BES suggests that such communities promote teacher and student learning when they support participants to process new understandings and their implications for teaching and are based on analysing the impact of teaching on student learning. (Timperley, Wilson, Barrar, & Fung, 2007, p. 203)

5. A possible use of interim assessments in New Zealand

The concept of interim assessments struck a chord with me in relation to Waitakere College's use of the AsTTle assessments for Reading and Number.

Currently we assess students at the beginning of Year 9, late in term 3 of Year 9 and late in term 3 of Year 10. This data is intended to have both a summative and a formative purpose. It is summative, because it is reported to parents as well as enabling our West Auckland cluster to benchmark each cohort's progress against the national means. However, it is also used formatively to enable teachers to set goals for students based on their areas of weakness in reading and number. Core class teachers discuss how to meet the students' learning needs in facilitated meetings which focus on the literacy and numeracy targets while also meeting the goals of Te Kotahitanga. Option teachers also have meetings in subject groupings led by the Te Kotahitanga Facilitators or other members of our Professional Learning team. In many ways these groups do represent the kind of professional learning community advocated by the BES.

And yet , despite some pleasing progress, many students still lag behind the national norms for their age group and ethnicity. One part of the answer is undoubtedly to move into a more intensive focus on formative assessment, so that teachers can develop the sophisticated range of skills necessary for in-the-moment assessment, including how to give effective academic feedback and feedforward. This is likely to be the next step in our professional development plan, which has already

encompassed substantial work in the areas of literacy, numeracy and thinking skills, as well as Te Kotahitanga.

However, interim assessments may form another part of the solution – and Marshall’s analysis of key success factors (as well as 13 ways to screw them up!) could also provide some helpful suggestions for ways of improving the way we manage the three summative AsTTle tests.

An interim test in term 2 could provide us with fresh data to give some idea of whether we have begun to move the students in key areas.

It would need to meet Marshall’s Criteria For Successful Interim Assessments.

Some are relatively straightforward:

Understanding and trust - teachers and students would need to understand the purpose.

Clear learning outcomes - the AsTTle outcomes are clear, though not simple to develop in students.

Long-term SMART goals -AsTTle targets are already in the school goals.

Good interim assessments - AsTTle tests are nationally developed, high quality tests, which gather rich data.

Ongoing leadership and support

The Principal and senior managers must of course be fully involved, attending teacher meetings, reflecting on the data, visiting classrooms and participating in Assessment for Learning professional development as well as providing supporting infrastructure.

We need to do some fresh thinking around others:

Scheduling of assessments and follow-up - scheduling of assessments is straightforward, but Marshall makes the valid point that when turnaround time is too slow, the value of the assessment data is nullified. He offered some new suggestions for achieving fast processing, such as schools which close early, involve all teachers in the assessment and analysis, and hold planning meetings based on the data all on one day. Another possibility would be to achieve the same result spread over two weekly staff meetings, with an early finish to provide some extra time. The aim would be to have the results analysed, discussed by teachers and fed into planning within one to two weeks at the most.

A hands-on role for teachers – We don’t suffer from the American problem where test papers are outsourced for marking, so that teachers are entirely divorced from the results! However, the idea of involving the entire staff in the assessment rather than leaving it all to the English and maths teachers has merit. This is one way in which all teachers could see for themselves the kinds of literacy (or numeracy) issues which present difficulties for students.

E-AsTTle will change the marking process and remove some of this burden, but it is still important for teachers to have some hands on knowledge of what is involved, so that they can see students' strengths and weaknesses and plan strategies to address them.

Effective data display – despite the many merits of AsTTle the data is still quite complex for many teachers and students to follow. We need to think harder about what teachers and students really need to know and find the simplest, most effective way to display this so that it makes sense to them and can be used. Hopefully E-AsTTle will offer some improvements in terms of student-friendly language and data display ; it will then be up to us to help teachers make use of this to drive learning improvements.

Immediate action planning

This relates to the scheduling issues discussed above. It is particularly difficult to schedule core class meetings because some teachers have as many as four or five core classes. However, we need to find a way to speed up the process so that teachers can hold planning meetings based on the assessment data as soon as possible after the analysis. This may involve some rethinking of a process for subject departments , as well as for core class teachers.

Student involvement

This is something we already do, but can do better on a school-wide basis, so that students become fully involved in their own development.

Relentless follow-up

This is where the assessment for learning professional development comes into play. Teachers are expected to implement their plans, constantly checking for understanding, using techniques such as quality questioning, wait time, feedback and feedforward , peer and self assessment and seeking to address learning problems as soon as they became aware of them.

"Rick Du Four's 3rd question (Whatever It Takes)

'How will we respond when a student experiences difficulty in learning?'

Re-teaching louder and slower won't change results!

The response must be:

Rapid

Attuned to needs

Non-negotiable "

(Marshall, *Effective Use of Interim Assessments to Close the Achievement Gap*, 2008)

Whether or not we do decide to implement interim assessments, Marshall's criteria for their successful use have provided a number of possible improvements to the way we use the current AsTTle data. This in itself would enable us to make a more effective formative use of summative assessments.

6. Formative uses of in-school exams and NCEA internal assessment results

One further question which we and other secondary schools may wish to ask is whether we use our in-school practice exams in the senior school in a formative way. In one sense, of course, their purpose is entirely formative – practice for the end of year external exams. But to what extent do schools make good use of the information we have from these exams on a school-wide basis?

As we become bogged down in marking and reports, do schools and teachers consciously schedule follow-up time when concepts that were not well understood can be re-taught? In many cases teachers feel compelled to race on to the next topic; in some cases the assessment results come back to the students so long after the exams that they are meaningless.

Many individual teachers do have good strategies including self and peer review to help students understand where they have gone wrong in exams and assessments and to follow up with further teaching. However this is another area for future professional development as well as sharing of best practice.

In recent years we have sought to use AsTTle results from the previous year, along with early NCEA internal assessment data and school exam results to identify students in various target groups for closer monitoring and follow-up support. This has borne some fruit in terms of improved results for individuals as well as for our target groups. However, the more skilled our teachers become at “agile teaching, responsive to student learning, minute to minute, day-to-day, month by month”, the more likely we will be to fully meet our goals of raising the achievement of every student.

Comment:

Kim Marshall's presentation has become a jumping-off point for a whole strand of further investigation into where our school will go next with formative assessment. While his advocacy of interim assessments comes out of the American context, it is firmly grounded in important research findings about the value and importance of using assessment as a tool to promote learning. It drew me back to re-read Black, William et al and other seminal works on assessment.

The other bonus from this exploration was becoming fully aware of the depth and quality of New Zealand's best evidence syntheses. I was already familiar with *Quality Teaching for Diverse Students in Schooling*. I have found *Teacher Professional Learning and Development* to be equally authoritative and surprisingly succinct, considering its bulk! Its conclusions about what works in teacher professional learning offer insights which every school leader should be aware of when seeking to bring about change in their schools.

On the next page are some questions you may wish to explore with your colleagues.

Some questions we could ask about our own schools:

Moving on without re-teaching

- Do teachers sometimes move on to the next topic without re-teaching or following up gaps revealed by assessments?
- How can we make space for timely follow-up teaching informed by assessment information?

How proficient are our teachers in using in-the-moment assessment?

- What professional learning do our teachers receive in the skills needed for 'checking for student understanding, minute by minute, day by day' and using this to promote learning?
- Have we considered professional development around strategies such as questioning, improving the quality of oral and written feedback and feedforward, self and peer assessment?

A place for interim assessments?

- Do we currently make formative uses of summative assessments such as internal exams or literacy/ numeracy testing?
- If not, how could we better use this information to inform the next phases of planning and teaching?
- Is there a way for senior managers to have some awareness of student progress between summative assessments in order to provide more focused leadership of learning?

Forums for sharing assessment data

- What forums exist for teachers to analyse student achievement data and use this to inform planning for next steps?

Investigation of the best evidence syntheses

- Have teachers been offered professional learning opportunities which make use of the BES information about what works for our diverse student population?
- Are senior managers responsible for professional development aware of the findings of the BES on Professional Learning? Have we thought about using this to evaluate our approach to professional learning within the school?

The major source of ideas for this chapter was

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New Leaders for New Schools assessment paper is available free at:
www.marshallmemo.com

This site is regularly updated with current educational issues.

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CHAPTER FOUR

Using emerging technologies to create situated learning

Major source: Chris Dede

Most of us are aware that e-learning presents a multiplicity of educational possibilities, but for many school leaders and teachers, our use of ICT to support learning has not got much beyond word-processing, spreadsheets and internet searching. It is often pointed out that there is no point in using 21st century technology for 20th century purposes with 20th century pedagogy. Chris Dede is working at the forefront of finding how to use emerging interactive technologies effectively to aid in learning sophisticated problem-solving and inquiry skills and transfer their insights from classroom settings into real world contexts. He proposes a new pedagogical model which we need to grasp as we seek to prepare our students for the 21st century. This is highly relevant as we set about implementing our new curriculum in New Zealand.

1. 21st century – how is it different?

" The problem is that what kids do outside school often looks much more like 21st century work than what they do inside school." (Dede, 2008)

The 21st century is quite different from the 20th century, in Dede's view , with new capabilities needed for work, for citizenship and for self-actualization:

- A transforming workplace and economy
- A world too complex for an individual to fully understand
- A pace of change that requires high degrees of flexibility and tolerance for uncertainty.

The rapid advance of information technologies is mind-boggling, including developments in all the following fields:

- Device (cell, phone, HDTV, personal digital assistant)
- Application (work processors, intelligent tutoring systems, educational simulations)
- Medium (shared virtual environments, interactive TV, world-wide web)
- Infrastructure (internet, telephone system, cable and broadcast television, cyberspace)

The term Web 2.0 is now being used to describe " a shift in leading edge applications on the World-Wide Web, a shift from the presentation of materials by website developers to the active co-construction of resources by communities of developers."

While most teachers hold back from engaging fully with the new interactive technologies, young people are grasping them with alacrity in their personal lives. Cell phones, social bookmarking, social tagging, blogging, podcasts, wikis, interactive virtual world and software for personal expression and sharing (e.g. Facebook, Youtube, Twitter, Flickr)... the list goes on. (Dede, A Seismic Shift in Epistemology, 2008) This presents both a challenge and an opportunity.

Distributed work, cognition and learning

These and even newer technologies are transforming the global work-place as well as the ways people think and learn.

- Cognition is distributed across human minds, tools/media, groups of people and space-time – dispersed physically, socially and symbolically. Teams of people regularly collaborate on challenging intellectual and creative tasks between different locations in all parts of the world. This applies to business, education and non-profit organisations as well as individuals.
- Technology is not very creative or intelligent, but is very sophisticated at doing ‘routine’ tasks, which previously provided jobs for many people.

Incidentally, Dede used the opening sequence from ‘The Devil Wears Prada’ for a mind-blowing but realistic example of distributed thinking in the work-place.

2. New curriculum, new literacies, new pedagogy

Our new curriculum is a response to this changing world and the key competencies lie at the heart of the shift we will need to make in our pedagogy if this is to be more than a token gesture.

“ Everyone now needs the kind of higher order thinking skills formerly only developed at tertiary level, and they need to develop them by a more direct route than that allowed under the old apprenticeship model. Because people now need to go beyond understanding and reproducing existing knowledge, because they need the ability to work with knowledge to generate new knowledge, a 21st century education system needs to emphasise a systems-level understanding of knowledge and higher order thinking skills.

These are the ideas behind key competencies 4 and 5 (‘thinking’ and ‘using language, symbols and text’. “ (Bolstad & Gilbert, 2008, p. 100)

Leu’s characteristics of new literacies

Leu identifies the thinking behind the need for new literacies and points out that they have to be dynamic to keep up with constantly evolving technology.

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|----------------------------------------------------------------------------------------------------------------------------------------|
| 1. Emerging ICT tools, applications, media and environments require novel skills, strategies and dispositions for their effective use. |
| 2. New literacies are central to full economic, civic and personal participation in a globalised society. |
| 3. New literacies constantly evolve as their defining ICT are continuously renewed through innovation. |
| 4. New literacies are multiple, multi-modal and multifaceted. |

Jenkin's framework for new literacies

Jenkin's framework is a useful description of the new literacies which are needed to navigate the new technologies:

Play	experimenting with one's surroundings in problem-solving
Performance	adopting alternative identities for improvisation and discovery
Simulation	interpreting and constructing dynamic models of real-world processes
Appropriation	the ability to meaningfully sample and remix media
Multi-tasking	scanning one's environment and shifting focus to salient details
Distributed cognition	fluently using tools that expand mental capacities
Collective intelligence	pooling knowledge with others towards a common goal
Judgement	evaluating the reliability and credibility of different information sources
Transmedia Navigation	the ability to follow the flow of stories and information across multiple modalities

What about the 'basics'?

Dede makes it clear that these new literacies are not intended to replace the old ones – students still need literacy and numeracy as a foundation for the higher order skills. However, he believes we stop in the wrong place, before giving students access to the higher order skills they will need in their lives.

The additional basics

His advice to his daughter when she asked what subject she should major in at university was that it didn't matter, as long as she came out with two vitally important skills:

- **Expert decision making - what do you do when all known solutions don't work?**
- **Complex communications**

" Web 2.0 is redefining what and how and with whom we learn. For example, in Wikipedia, 'knowledge' is constructed by negotiating compromises among various points of view. This raises numerous questions. How do we in higher education help students understand the differences between facts, opinions and values - and how do we help them to appreciate the relationships that create "meaning".....Since almost any piece of information can now be found online in less than a minute (along with inaccurate and biased data) what core knowledge does every student need in order to prepare for twenty-first century work and citizenship? (Dede, A Seismic Shift in Epistemology, 2008)

Faced with these changes , educators need to focus on **a particular suite of understandings and performances**

Collective problem resolution via mediated interaction:

- **Problem finding before problem solving**
- **Comprehension by a team, not an individual**
- **Making meaning out of complexity**
 - Utilising sophisticated tools and representations
 - Recognising and matching patterns
 - Judging the value of alternative patterns
 - Communicating to others with differing perspectives

Dede sees educators beginning to evolve towards **distributed learning processes:**

- Sophisticated methods of learning and teaching
 - Guided learning by doing
 - Apprenticeships, mentoring
 - Learning communities
- Orchestrated across classrooms, homes, workplaces, community settings
- On demand, just-in-time
- Collaborative

A new pedagogy

These 'seismic shifts' call for a different model of pedagogy:

- **Experiences are central**, rather than information as pre-digested experience (for assimilation or synthesis)
- **Knowledge situated in a context and distributed across a community** (rather than located within an individual) = learning 'with' instead of 'from'
- **Reputation, experiences and accomplishments as measures of quality** (rather than formal tests)

This does not mean throwing out current pedagogical models consistent with the recent findings of the BES on Quality Teaching for Diverse Students, which many New Zealand schools are currently working on.

The first principle arises from the constructivist approach of helping learners to actively invent individual meaning from experiences , supported by the findings from brain science discussed in Chapter 2.

The second can be linked with cooperative learning and relationships-based approaches such as Te Kotahitanga, as well as with the use of rich, authentic tasks.

The third is more difficult to achieve within a secondary school system caught up in a race for qualifications, although NCEA does have much more potential flexibility than its predecessors.

Bolstad and Gilbert point to this in their recent attempt to radically rethink the senior secondary school curriculum:

“ In this model, learning is not something done to the specification of another (or of a system), but something that is motivated by its personalisation.... Young people design, invent and produce themselves as learners who are individuals and part of collectivities...

Developing this model obviously requires learners to change the ‘script’ they have for themselves in relation to education. It also requires educational professionals to change their script and, importantly, it requires a system-wide change in the national educational script. Changing these spaces creates the spaces within which innovation can be produced.” (Bolstad & Gilbert, 2008, pp. 121-122)

However, almost every school does have some examples of situations where students experience the intrinsic rewards of achievement, independently of formal qualifications. Drama performances, sports achievements, cultural groups, rich authentic tasks, Young Enterprise spring to mind. The question is how to build the same kind of intrinsic motivation and reward into the learning programmes for every student.

Rather than waiting for an immediate change of the ‘national educational script’, there is still plenty we can be working on in our schools!

3. Development of ICT uses in education

Dede points out that earlier uses of computers in education were relatively limited, mostly aimed at lower order tasks such as learning facts or simple procedures, underpinned by behaviourist beliefs. The second tranche of ICT tools , such as intelligent tutoring systems is more complex, but still based on transmitting well defined content and skills. These are based on the cognitivist approach, which aims to help learners develop coherent mental constructs as the basis for knowledge and skills. This does have its uses for some content which is genuinely invariant and needs to be learned.

More suitable for the 21st century is the constructivist approach, whose goals have been well summarised by Dabbagh:

- “instruction as a process of communicating knowledge construction rather than constructing knowledge;
- teachers’ role as guide, rather than an expert transferring knowledge to novices’ “blank slates”;
- learning activities that are authentic and that center on learners’ puzzlement as their faulty or incomplete knowledge and skills fail to predict what they are experiencing.
- Encouragement for students to reflect on experiences, seek alternative viewpoints and test the viability of ideas.” (Dabbagh, 2006) quoted by (Dede, 2007)

“Student motivation to achieve these goals is determined by factors such as challenge, curiosity, choice, fantasy, and social recognition”. (Pintrich & Schunk, 2001)quoted by (Dede, 2007)

This is the underlying philosophy of approaches such as guided problem-based approaches and authentic or rich tasks. However Dede notes that these often make little use of ICT.

Situated learning

He advocates a step beyond this into “ the use of sophisticated ICT based on a complementary pedagogical theory, situated learning...” , to teach “...sophisticated ‘problem finding’ as the front end of the inquiry process for making meaning out of complexity.” (Dede, Reinventing the Role of Information and Communications Technologies in Education, 2007, p. 22)

Situated learning means that students learn in an authentic context, making a genuine contribution to the thinking / work with guidance from expert modelling and mentoring. Real-life examples include the way junior doctors are mentored from novice to expert, or the way graduate students work with research scientists who model in their laboratories the practice of scholarship.

Sophisticated ICT technologies now provide the opportunity through “immersive, collaborative simulation... to implement situated learning environments in classroom settings.” It is now possible for the expert community to be linked to the classroom in “collective problem resolution via mediated interaction.” (Dede, Reinventing the Role of Information and Communications Technologies in Education, 2007, pp. 23-24)

4. New generation interfaces for meeting 21st century educational goals

Dede identifies three complementary technological interfaces which can help in meeting 21st century goals.

i. World-to-the desk-top

This is now a familiar approach which enables learners to access “distributed knowledge and expertise across space and timestudents can access distant experts and archives, communicate with peers and participate in mentoring relationships and virtual communities of practice”. (Dede, Reinventing the Role of Information and Communications Technologies in Education, 2007, p. 24)

The role of the teacher becomes one of constructing the task and mediating the interaction with experts in a way consistent with the goals of problem finding before problem solving, comprehension by a team and making meaning out of complexity.

In working with existing tools and media the teacher needs to think about how to ensure that the learning situation creates an authentic experience and that the knowledge is situated within that context and shared across a community rather than residing with a single individual.

ii. Emerging MUVE interfaces (Multi-User Virtual environments)

This is where students can be immersed in virtual environments with digital artefacts and avatar-based identities. “MUVEs provide rich environments in which participants can interact with digital objects and tools, such as historical photographs or virtual microscopes.” Avatars (virtual characters which represent the student) are able to communicate through media such as text chat and virtual gestures. This type of ‘mediated immersion’ enables educational software designers “to construct simulated experiences

otherwise impossible in school settings.” (Dede, Reinventing the Role of Information and Communications Technologies in Education, 2007)

River City

Dede and colleagues are conducting design-based research on a MUVE-based learning experience, *River City* (<http://muve.gse.harvard.edu/rivercityproject/>). This is funded by the National Science Foundation and aims to improve middle school students’ educational outcomes in science.

River City is a simulated historically accurate 19th century city in which students become avatars. They work in teams of 3-4, trying to work out why people are getting sick and what could be done to remove the sources of illness. They interview residents such as people with the illness, health workers, merchants and university scientists. They gather data in various locations on changes over time and develop increasingly more sophisticated hypotheses, finding experts and archives to assist them. They also use virtual scientific instruments such as microscopes to test water for bacteria. They are also able to conduct an experiment by changing a variable and collecting data to test their hypothesis ; they can even visit the city with a sanitation system added to see how this affects the pattern of illness.

This MUVE is firmly placed within an educational context. Teachers can only register their classes once they have taken the relevant on-line professional development programme. The teacher is expected to work closely with students mediating the experience so that the learning is tailored to their individual needs. Research results show students are highly engaged by *River City* and are developing sophisticated problem-solving skills.

High quality educational MUVES are still relatively scarce, but are worth seeking out. For New Zealand teachers, TKI is a good place to start. Innovative teachers and schools are beginning to find ways of working with existing MUVES. As they do so, it will be important to make sure this is meeting the goals of problem finding, distributed cognition and making meaning out of complexity.

iii. Handheld Augmented Reality Project (HARP) - ubiquitous computing

This is a very new educational tool concept at this stage, but offers exciting future possibilities. Dede suggests we should be thinking about making use of this technology within 3 to 5 years in our schools. It involves using wireless handheld devices (WHDs) which include the facilities of personal information managers, cell phones, internet connectivity and global positioning systems to create educational augmented reality (AR) situations.

Check out the HARP Augmented reality website for more information about this:

<http://isites.harvard.edu/icb/icbdo?keyword=harp>

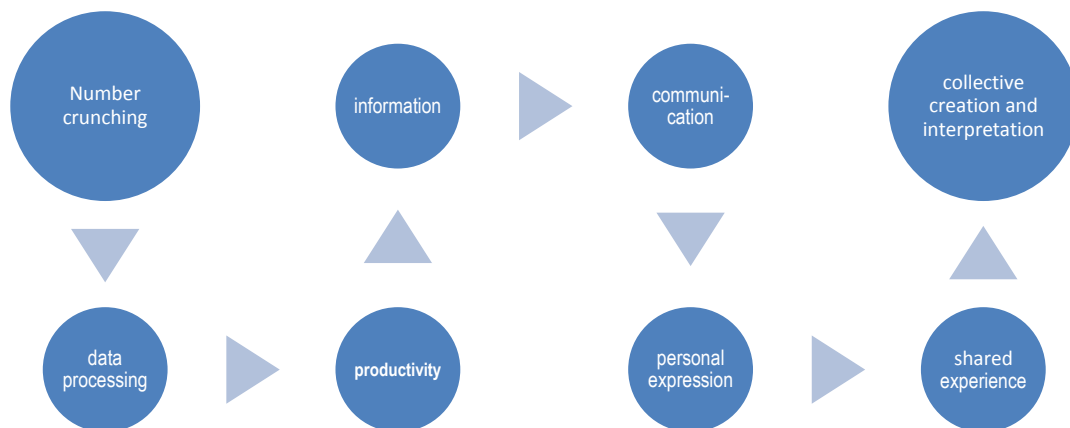
Alien Contact!

Dede is working with colleagues on this augmented reality project (AR) , which is funded by the US Department of Education Star Schools programme with a maths and literacy focus for middle school students. The aim is “to promote skills in collective problem resolution via mediated interaction.”

Students use a handheld computer which “ uses GPS technology to correlate the students real-world location to their virtual location in the simulation’s digital world.” Students move around a real location such as the school grounds, while the map on their handheld “displays digital objects and virtual people who exist in an AR world superimposed on real space.” Students work in teams of 4 to explore the possible intentions of aliens who have landed on earth. They interview virtual characters situated in an AR world located immediately outside the school, collect digital items and solve maths and literacy puzzles to work out why the aliens have landed. A jigsaw approach is used, where each team member has a different role (chemist, computer expert, linguist or FBI agent) with access to different data, so collaboration is a prerequisite for solving the problems they encounter. (Dede, Reinventing the Role of Information and Communications Technologies in Education, 2007, pp. 27-32)

iv. Web 2.0 and future assessment possibilities

Dede points out how the uses of ICT are constantly morphing into something new, from its earliest uses for number-crunching through to the Web 2.0 purposes of personal expression, shared experience and collective creation and interpretation, through tools such as blogging, wikis, social networking and tagging.



In his distributed learning course at the Graduate School of Education students learn and undertake assignments through face-to-face interaction, videoconferencing, wireless, handheld devices, small group collaboration through groupware, synchronous interaction in a virtual environment, synchronous threaded discussions, informal website-based learning experiences, shells for course authoring and socio-semantic networking. All of these approaches now present exciting possibilities for teachers and students in school settings to explore.

Check out his course material at <http://isites.harvard.edu/icb/icb.do?keyword=k7151>

Future assessment possibilities of social networking, tagging

Dede sees social networking as a potential powerful technology not only for sense-making, sharing and collaboration, but also for educational assessment purposes. He has set up a web-site which is used by his students but is open for all, EdTags <http://www.edtags.org> It functions as a social networking site , but by taking part in the network participants are also contributing to Dede's research on educational assessment.

The web-site includes some extremely useful material on educational uses of ICT, as well as a plethora of student generated wikis and other items. It has the Web 2 characteristic of containing diverse material, some high quality, some dubious . (*Be warned: The naked males I encountered on my first excursion into a wiki which was ostensibly about New York pizzas convinced me not to use this site directly with my Year 11 class!*) Users can find an item, add their own comments and save it for personal use but can also authorise others to access this.

Users' choices produce for each user a conceptual framework, and signals others who have made similar and very different choices. This can then inform the user's decision about who to contact next.

Meanwhile, Dede observes the changing conceptual frameworks of his students to see if the student's knowledge structure is developing into a more expert structure. He is using this experience to inform his work towards developing assessment tools which teachers could use.

Use of River City data for assessment purposes

Dede's current research involves thinking about how to make sense of all the data gathered from River City and use it helpfully for assessment purposes. The problem is that there is too much data, with logs of each student's activity which could give rich information about student progress. He is working on finding an automated way of showing this information in a simpler form which could be used by students for self assessment, as well as summary data for the teacher.

In the longer term he envisages this resulting in:

- Formative, diagnostic information for students and staff presented in customizable forms
- Continuous embedded assessments rather than single high stakes test
- A longitudinal record that guides design of curriculum and learning throughout life
- Insights to improve technology design individual instruction and engagement.

This may be some way off, but ...watch this space!

5. Professional development – communities of unlearning

Dede suggests we need professional development communities of ‘unlearning’. The central problem for many teachers is to unlearn many of our assumptions and beliefs about the nature of teaching, learning and schooling. In order to prepare our students for their 21st century futures, we need to:

- Develop fluency in using emerging interactive media
- Learn how to complement conventional instruction with collaborative inquiry-based learning
- Unlearn almost unconscious assumptions and beliefs and values about the nature of teaching, learning and schooling.

Comment

Prior to Dede’s presentation I considered myself to be adequately up-with-the-play with regard to the educational uses of ICT, comfortable with making productive use of world-to-the-desk-top interfaces. However this has motivated me to begin exploring some of the Web 2.0 uses which I had hitherto considered time-wasting and unnecessary for my personal fulfilment. I now understand the potential of this technology and the reasons why teachers need to grasp the opportunities it presents for engaging students in important learning experiences. I have some learning and unlearning to do!

The most important and helpful message for me has been the clear links he makes between 21st century learning goals:

Collective problem resolution via mediated interaction:

- *Problem finding before problem solving*
- *Comprehension by a team, not an individual*
- *Making meaning out of complexity*

and the kind of pedagogy we need to get there:

- *Experiences are central*
- *Knowledge situated in a context and distributed across a community*
- *Reputation, experiences and accomplishments as measures of quality .*

In my own school, we have been working towards this kind of pedagogical approach through our work with some Year 9 and 10 students on rich, authentic tasks, which are in some respects examples of situated learning. However I can see that there are many more possibilities for enriching this work through effectively harnessing the potential of emerging technologies. This will be one of our next challenges.

Building the un-learning community into our strategic planning over the next few years will be the other one. It is vitally important in a mid to low decile school to ensure that our students do not depart from our school on the wrong side of the digital divide. We need to understand how to translate high expectations into robust learning which will make our students effective participants in the Web 2.0 world of the future. If we are to prepare them well for their future lives, we need to begin the learning and unlearning now.

Some questions we could ask about our own schools

21st century learning goals

- Do we see students' enjoyment of new technologies as a distraction/ risk or an opportunity?
- What thought have we given to the new skills our students will need to keep up with constantly evolving technologies?
- How does this connect with the goals of the NZ Curriculum?

Building future-focused skills for collective problem resolution

- What do we do already which helps students develop the skills of:
 - Problem finding before problem solving
 - Comprehension by a team
 - Making meaning out of complexity?
- How can we develop these skills more systematically?
- How can we make use of new technologies to support this goal?

Pedagogy

- Do we understand the pedagogical approach we need in order to help our students become effective participants in the world of 21st century technologies?
- How does this connect with our current pedagogies?

Professional learning needs of teachers

- How proficient are our teachers in the use of emerging interactive ICT technologies?
- How knowledgeable are our teachers about Web 2.0 and its implications?
- What professional learning do teachers and leaders need in this area?

The major source of ideas for this chapter was

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Explore web-sites
River City (<http://muve.gse.harvard.edu/rivercityproject/>)
HARP Augmented reality
<http://isites.harvard.edu/icb/icbdo?keyword=harp>
Dede's distributed learning course
<http://isites.harvard.edu/icb/icb.do?keyword=k7151>
Edtags social networking site www.edtags.org (*but watch out for viruses*)

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