

Welcome to the 21st Century

Andrew Churches

Kristin School

<http://edorigami.wikispaces.com>

<http://edorigami.edublogs.org>

Abstract:

This discussion paper is the combination of several blog and wiki articles on Education in the 21st Century. The discussion focuses on the 21st Century Learner, and their learning needs. It asks questions about the 21st Century Educator, the 21st Century Classrooms and what is needed to facilitate 21st Century Learning. There are many questions posed and left unanswered. No one has all the answers, but if we collaborate, together we may come up with a few of them.

Andrew

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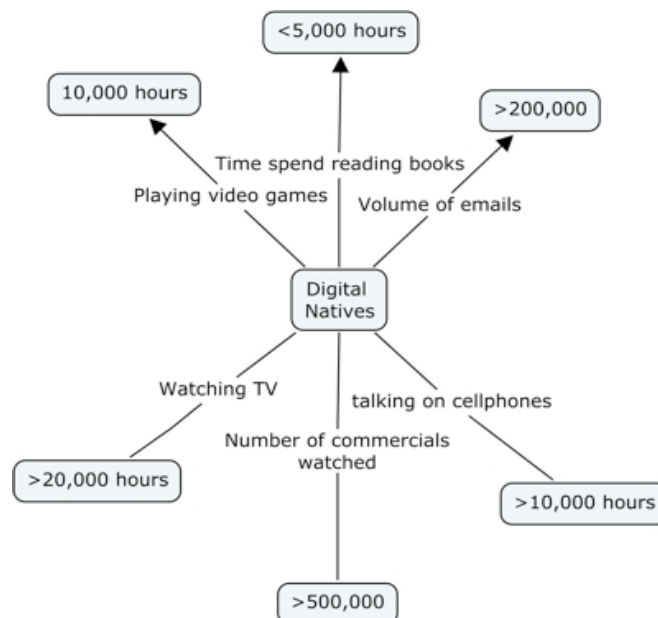
Welcome to the 21st Century

(with apologies for the tardiness)

Most of us have met them. Even the more short sighted of teachers can see them increasing as our future becomes increasingly electronic. Whether we call them [Digital Natives](#) ([Marc Prensky](#)), [Digital Children](#) ([Ian Jukes](#)), [Neo-Millennials](#) ([Dieterle-Dede-Schrier](#)) or 21st Century Learners ([Sheryl Nussbaum-Beach](#)) they are increasingly becoming the *future of teaching*.

The 21st Century Learner?

They are students are shaped by their environment. The environment they are exposed to is media rich, immediate, fast, engaging, dynamic and instant. It is electronic and digital, it is a communication medium with instant gratification. Marc Prensky, described the array of media the students are exposed to in his papers on Digital Natives [I](#) & [II](#) [8,9]. Ian Jukes in his paper on Digital Children [11] discusses these shaping and forming forces, as does the team from Harvard University (Dieterle, Dede and Schrier) [12].



This diagram is based on media exposure for American college students before they finish college. The data is from Prensky's Papers on digital Natives [8,9]. The volume of each media the students are exposed to is enormous. These figures are reflective of our students experiences too.

This obviously has a huge effect and impact on our students. Digital Natives [8,9] are those students who, through consistent exposure to these factors and access to a variety of digital media, are engaged, motivated and learn by the use of digital technologies. They, the 21st Century Learner, are adept in the use of digital medium, and as [Dieterle-Dede-Schrier \[12\]](#) and Marc Prensky [8,9,10] argue are wired to used these tools.

Different kinds of experiences lead to different brain structures.

-Dr. Bruce D. Berry, Baylor College of Medicine [9]

So what is a Digital Native, a Digital Child, A Neo-Millennial or 21st Century Learner?

It helps to look at a Digital Native [8,9] with reference to someone we are familiar with. In many ways teachers from the last century represent Digital Immigrants. [8,9] This is not meant to be offensive, rather it is a reflection of how many of us, as children were taught and in many cases taught to teach. (source: [Educational Origami](#))

<div>Native learners (Digital Natives or Neo-Millennial Learners)</div>	Teachers (Digital Immigrants)
Multiple multimedia information sources rapidly	Slow controlled information release – limited sources
Parallel process & multi-task	Singular process and single or limited task
Processing order Picture, Video & Sound --> Text	Processing order Text --> Picture, Video & Sound
Random access to interactive media	Linear, logical sequential access
Interact/network simultaneously to many	Interact/network simultaneously to few
Comfortable in virtual and real spaces	Comfortable in real spaces
Prefer interactive/network approach to work	Prefer students to work independently
“Just in time” learners	“Just in case” learners
Instant access, rewards & gratification	delayed/differed access, rewards & gratification
Learning is relevant, instantly useful and fun	Learning is to teach to the curriculum guide and standardized tests.



Question

Where do you fit? If you were to highlight or tick the characteristics that best suit you where would you be? Native or immigrant?

The preferred method and mode of learning are changing. They are being shaped by the:

- environment our students learn and play in
- the exposure and access to digital media
- 21st Century teachers



All of these factors are changing teaching.

The remainder of this discussion paper looks at a vision of teaching and learning in the 21st Century. Specifically the way we teach (the 21st Century Teacher or Educator), how we design and build our classrooms (21st Century Learning Spaces) and how we are resourced (Facilitating 21st Century Learning).

For teachers to engage and educate, to facilitate and motivate, our methods of teaching must match our students methods of learning; our teaching spaces must reflect their learning spaces; our teaching tools and resources must support their learning strategies. There must be in short, **a paradigm shift in education** . Teachers must become 21st Century Learners and 20th Century schools must become 21st Century Learning Organisations. Many of us and many of our colleagues are well on the way to this. So....

.....Welcome to the 21st Century

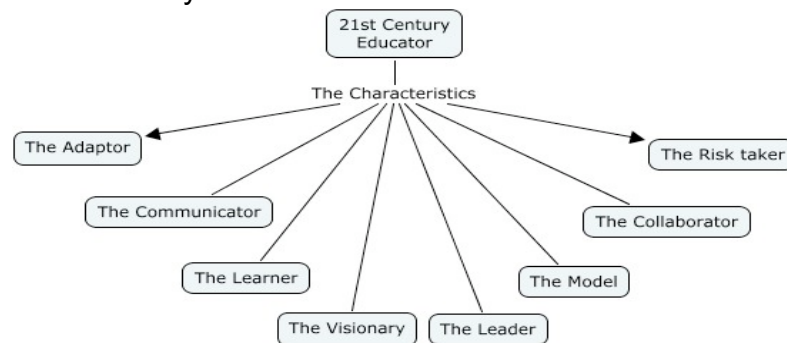
The 21st Century Teacher/Educator

The first part of this paper dealt briefly with our 21st Century learners. It is fair to say we have heard a lot about them. We know that they are:

- Collaborative, networking and communicators
- Adaptive and creative
- Information, media and technology savvy
- immediate and instant
- they like instant gratification
- they enjoy media in its various forms.



But what about the 21st Century Teacher, what are the characteristics we would expect to see in a 21st Century Educator. We know they are *student centric*, *holistic*, they are teaching about *how to learn* as much as teaching about the subject area. We know too, that they must be 21st Century learners as well. But teachers are more than this.



Characteristics of the 21st Century Teacher.

This part of the paper examines eight characteristics of a 21st Century Teacher and addresses each of the above characteristics.

The Adaptor

The 21st Century Educator is an *adaptor*. Harnessed as they are to an assessment focused education model, the 21st Century Educator must be able to adapt the curriculum and its requirements to teach in digital modes.

They are able to adapt software and hardware designed for a business model into tools suitable for education and specifically for a variety of age groups and abilities. There is very little software specifically designed for education.

Microsoft Office is a corner point of most software libraries but as the name suggests is an office product. The Adobe family of products are regarded as industry standard. Industry, but not education. These are BRILLIANT tools, but they are not educationally designed. What education specific tools do we have?





Question

If we look at the software installed on our computers most comes from business and very little is designed for student use. What education specific tools do you have on your computer and on your network?

They must also be able to adapt to a dynamic teaching experience. When it all goes wrong in the middle of a class, when the technologies fail, the show must go on.

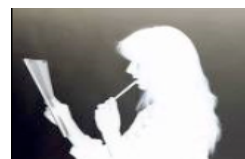
As 21st Century educators, they must understand and apply different learning styles. They must be able to adapt their teaching style to be inclusive of different modes of learning. The 21st Century teacher matches the students preferred learning style to a variety of ICT tools. Gone is the chalk and talk approach that most of us experienced as children. It is replaced by learning that touches all of the senses; auditory, visual, kinaesthetic as well as those who prefer the read/write learning style.

The Visionary

The 21st Century Educator is a visionary. The visionary teacher can look at other people's ideas and approaches and envisage how they would use these in their class.

The visionary also looks across the disciplines and through the curricula. They can make links that reinforce and value learning in other areas, and leverage other fields to reinforce their own teaching and the learning of their students.

Imagination is a key component of adaptability. It is a crucial component of the educator of today and tomorrow. The 21st Century Teacher/Educator sees the potential in the emerging tools and web technologies, grasps and manipulates them to serve their needs.



Question.

If we look at the technologies we currently see emerging, how many are developed for education? How many can we adapt to suit our needs and those of our students?

The Collaborator



Ning, Blogger, Twitter, Wikispaces, Bebo, MSN, MySpace, Second life – The 21st Century Educator is able to leverage these collaborative tools to enhance and captivate learners. They too, must be collaborators; sharing, contributing, adapting and inventing.

The teacher's role here is often that of moderator, facilitator and referee; shaping conversation, refocusing discussion and leading by example. The teacher learns how to structure and develop conversation. The electronic medium enables students who would normally be quiet, shy or retiring to participate, discuss, debate and argue.

Teachers can collaborate and contribute by becoming involved in the many online communities. They can provide their work under the Creative Commons licence. This allows educators access to a huge array of materials at no cost. The OER (open educational resources) project is a good example of resources produced under the Creative commons banner.

The Risk taker



How can you as an educator know all these technologies? How can you teach the students to use them? There are so many, so much to learn.

The 21st Century Educator takes risks and is prepared to surrender to the student's greater knowledge. Have a vision of what you want and what the technology can achieve. Identify the goals and facilitate the learning.



Use the strengths of the digital natives to understand and navigate new products, have the students teach each other. The learning pyramid shows that the highest retention of knowledge comes from teaching others. Trust your students.

The Learner

We expect our students to be life long learners. How many schools have the phrase “life long learners” in their mission statements and objectives? We too, must continue to absorb experiences and knowledge. We must endeavour to stay current. I wonder how many people are still using their lesson and unit plans from 5 years ago?



In subject areas like, Information Technology and certainly in many of the sciences, especially the life sciences: knowledge, understanding and technology are fluid and dynamic. They are evolving and changing. To be a teacher here you must change and learn as the horizons and landscape changes.

The 21st Century teacher or educator must learn and adapt.

The 21st Century Teacher is a 21st Century Learner too.

The Communicator

Anytime, Anywhere learning

“24/7 Anywhere, anytime Learning” is a catchphrase. It is paired with “*The life learner*”. Too have anywhere, anytime learning, the teacher to must be anywhere and anytime; not necessarily the same teacher. But the 21st Century teacher is a communicator, fluent in tools and technologies that enable communication and collaboration. They go beyond learning just how to do it. They also know how to facilitate communication, stimulate and control it, moderate and manage it.



The Model

As Teachers we model the behaviours we expect from our students. There is an expectation that teachers will teach values. In fact we must model values.

For some, we are the most consistent part of our student lives. Teachers may see the students more often, for longer and more reliably than their parents.



The 21st Century Educator also models reflective practice; whether it's the quiet, personal inspection of their teaching and learning, or through reflective practice via blogs, twitter and other mediums, educators must look both inwards and outwards.

Teachers model a number of other characteristics, not necessarily associated with integration of technologies or the curriculum, but which are of equal importance. They model:

- tolerance and respect
- acceptance
- a wider view than just their curricula areas
- global awareness
- reflection
- other human values

The Leader.



Whether a champion of ICT integration or the quiet technology coach, a teacher leads by example. They could be a maverick or early adopter (See [LOTI](#))[14]. But above all the 21st Century Educator is a leader.

Leadership, like clear goals and objectives, is crucial to the success or failure of any project.

Thousand and Villas paper, [Managing complex change](#) towards inclusive schooling summarises this brilliantly, showing the elements required to achieve successful change:

vision + skills + incentives + resources + action plan = **change**
 skills + incentives + resources + action plan = **confusion**
vision + incentives + resources + action plan = **anxiety**
vision + skills + resources + action plan = **resistance**
vision + skills + incentives + action plan = **frustration**
vision + skills + incentives + resources + = **treadmill**

The 21st Century Teacher must have vision, skills, incentives, the resources and an action plan to educate successfully in the 21st Century.. They are the subject experts, often a counsellor and frequently an administrator. The role is a complex one.

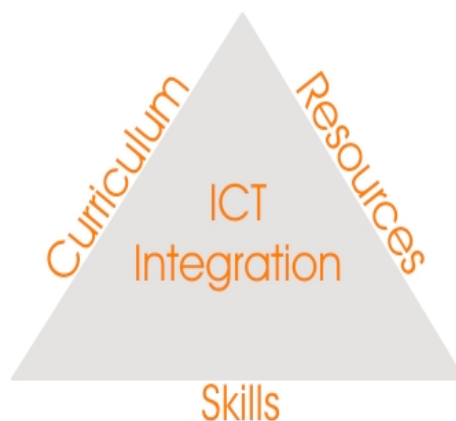
Facilitating 21st Century Learning

There are *three factors or enablers* that work together to facilitate the integration and implementation of ICT. If any of these factors are absent, then the level of integration is impaired.



The three factors

The three factors are **resources**, **skills** and **curriculum**. They form a triangle, **the integration triangle**. The area of the triangle represents the level or degree of integration. The bigger the area, the greater the integration and implementation and correspondingly the higher one is on the [LOTI scale](#) [14]





1. Resources:

These are the classroom tools and materials available to the teacher in the classroom. A well resourced room or school is more likely to achieve integration than a poorly resourced one.

Important resources:

- Interactive whiteboards
- Classroom desktop computers
- Pools of laptops or one to one programs
- PDA's, iPods and cellphones
- Educationally focused software
- Learning and content management systems
- Video and audio conferencing
- Cameras, videos, tripods, microphones, speakers, headphones
- Media production facilities

Coupled with ubiquitous access to high speed internet access, these are great enablers of 21st Century learning. The use of these resources for teaching and learning must be tailored to your curriculum. Then ICT implementation is easier.

Even with a high level of resourcing, integration it is not assured. The two other factors, *Skills* and *Curriculum* are critical and must be available in equal quantities.

But what of the classroom that struggles with one computer or perhaps have one lab for a large school, are they condemned to poor integration? No, but they are obviously hampered and limited.

Professional development & time is also a resource.

Time is a precious and limited resource. Time to play and experiment is hard to find when teachers are prescribed a number of non contact periods and management judiciously fills our timetables.



Question

When was the last time you or your teachers had "play time" to experiment?

Often teachers are hampered by the limitations of the "[one size fits all](#)" model of ICT management. Computers are locked down, teachers do not have administrative rights, they cannot install software, update products or even install extensions in their web browser.



Question

How often is experimentation limited by draconian measures from ICT support departments?

*How many of you, as classroom teachers, have administrative rights on your computers?
How many of you are encouraged to experiment and play?*

How many of you would be supported and understood if it all when wrong and you returned to your support staff asking for help?



2. Skills

Skills, fall into two categories, *Technical* and *Pedagogical*. Of the two, pedagogical skills are more important.

Technical skills, are about the ability to operate the software and hardware.



Question

When new technologies are introduced to your school, is support provided with this? What model of training is provided for the staff? Is it a "just in time" or "just in case" model? Is it one-to-one, small group or provided all-at-once?

A key to this is the ability to adapt, adopt and modify. But, it is the confidence and competence to teach and facilitate learning through the use of these technologies that is critical.

Strengths in pedagogy can and will make up for deficits in technical ability. The classroom teacher's ability to use a variety of pedagogical strategies is key to integration. The teacher who sees little value in the use of Information and Communication Technologies, even if they have high technical ability, will always limit the level of integration. The teacher, with an understanding of 21st Century pedagogies, who recognises that these technologies are enablers and motivators for our 21st Century learners, is able to use the learner's own skills and abilities (as well as their own skills and insight) to enhance their learning and the integration of ICT.

Strengths in technical skills and pedagogy make up for short falls for the other two sides of the integration triangle. The classroom teacher, who manages their limited resources, structures their lessons to enable all students to access these limited resources; who by careful planning and management enables all of their charges to be involved, to have hands on time; who structures the learning to have higher order thinking skills – to create, evaluate and analyse - is a better integrator, than those with all the resources but who use the computers only for lower order processes.

Bloom's Taxonomy

Higher Order Thinking

Create

Evaluate

Analyse

Apply

Understand

Remember

Lower Order Thinking

Brilliant learning and ICT integration often comes out of classrooms with one computer, facilitated by a teacher with passion and vision. Imagine the outcomes possible for them with suitable resources and a full understanding curriculum.

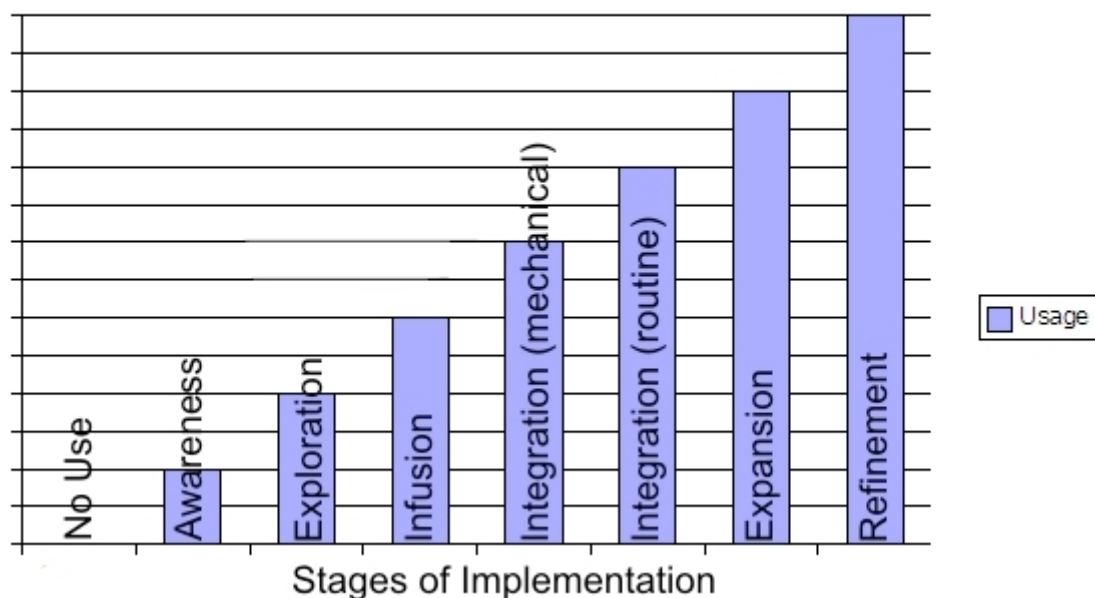


3. The Curriculum.

Does our curriculum reflect 21st Century learning? Are our assessment models reflective of the world our students live in now and in the future?

The New Zealand curriculum has recently been revised. This revision reflects a new paradigm in teaching and learning, which considers the world our students inhabit. However the curriculum is still hamstrung by assessment models more suited to an older age of teaching.

Levels of Technology Implementation



Information and Communication Technologies are enablers of learning. They are motivating and engaging. Are we striving for integration of these tools and technologies or are we settling for infusion, just a thin veneer of technology use within our units?[14]

What of cross curricula studies? Do we leverage the teaching of other teachers, build on the skills and processes they teach and so reinforce our own?

The integrating curriculum (and drilling down into the integrating curriculum - subjects and unit plans), which support ICT integration is dynamic, exciting and motivating. The use of 21st Century technologies can be ubiquitous, inclusive and specific. The selection of tools and resources are curriculum driven. Integrated units are constantly reviewed. Teachers and students contribute to the development and revision of the learning experience. They are student centric. Teachers are encouraged to use digital and traditional approaches to teaching and learning.

Teaching drives the technology rather than technology driving the teaching.

The curriculum must reflect the world our students will inhabit. Continuing to teach a 20th century curriculum in the 21st Century, prepares our students for a world that no longer exists.

In Conclusion, it is the measure of all three of these factors which results in the level of ICT integration in our classroom and in our schools. If any factor is in deficit, then integration is inhibited.



Questions

Some Questions to ask:

What are your school's identified ICT objectives and goals?

Are these goals administratively focused or educationally focused?

Where does your school want to be with regards to ICT implementation in 1 year, 5 years?

What level of consultation and buy in do key groups have? (Students, staff, the community)

How are these goals integrated into your budgeting and curriculum planning?

How are these goals supported by professional development for staff?

How are these goals resourced?

How are these goals implemented within the departments, faculties and the classroom?

Do you have peer review of your curriculum, subject, unit plans and of teaching practice?

Is this collegial support or appraisal?

In Industry implementation of a new product and the training of staff are usually subsidised dollar for dollar. What is the ratio of ICT investments to training investment?

What revision and review process do you have in place for your ICT goals, investment and training? To what degree are your students, community and staff involved in these reviews?

To what level is the implementation of ICT in teaching and learning mandated? Is there any mechanism for accountability?

What accountability is in place for technologies put into the classroom to ensure they are utilised?

What decision making process is involved in setting student and staff access and administrative rights to computers, networks and the internet? Who established your policy? Your board, the principal or the technician(s)/support staff? What is the rationale for this decision - technical, administrative or educational? Who and how is this reviewed? Are your pedagogies reflective of 21st Century teaching and learning?

21st Century Learning Spaces

The more we consider teaching and learning in the 21st Century, the more obvious it is that teaching and learning spaces must change to reflect the paradigm shift we are experiencing.



Classrooms have improved since the 19th Century, but essentially they are designed for the same traditional mode of teaching. Many classrooms are:

- teacher-centric,
- designed for single to many communication style,
- lack flexibility,
- poorly designed for collaboration and communication,
- have limited support for technology,
- rigid in design often unable to be adapted for any other purpose,
- individual focused rather than group focused.

We have seen improvements in the facilities within some classrooms. There are better desks and chairs which are more comfortable and of different sizes to accommodate the physical differences in learners. Classroom walls have spaces to decorate and display student learning. There has also been the introduction of technologies like data projectors, audio and visual systems, better lighting and light control. But many of these are still implemented in the 20th Century mode.



With a 21st Century curriculum and access to resources, 21st century learners and educator are limited and restricted by such rooms. Our teaching spaces need to match our 21st Century learners and teachers.

Our classrooms must encompass the following characteristics.

Access to technology and media:

The 21st Century classroom is;

- networked
- adequately provided with a rich internet connection to support media streams, personal ([skype](#)) and group (video conferencing/access grid) communications.
- Able to upload and download students work and research to suitable learning management systems to support anywhere anytime learning and collaboration.

Facilities need to be in place to enable media production:

- video
- audio
- text/image based.

The 21st century classroom will also have access to suitable tools like networked photocopiers that can scan, email and fax. For 21st Century Learners and Educators, these tools will be as comfortable as pen and paper.



Question

Many projectors have the facility to support wireless networking enabling the users (teachers and students) to easily connect and then switch between users. The user does not need to connect a cable rather they connect wirelessly. This flexibility is essential for the 21st Century learners. How many projectors have this enabled?

Classroom design.

Traditional classrooms are designed for a teacher centric delivery mode. This is a one to many mode. 21st Century learners are collaborators and communicators. They function carefully in the many to many and many to one modes. So the classroom must be designed to enable group collaboration. The classrooms must have the flexibility in furnishings and technology to be rearranged with ease and speed. The rooms must be able to switch rapidly between individual or group situations, between presentation, communication and collaboration modes. Whether as an individual or in small or large groups, learners and educators will be able to connect, collaborate, share and report - using projection and audio/video conference and web publishing.

Classrooms must be able to adapt to different needs of the learners and the lesson. There needs to be space for students to work quietly and reflectively; space to operate in small groups discussing and debating; space to meet collectively to report, discuss, plan and teach and well as space for the class to work together.

Display spaces.

Students need access to real and virtual display spaces. Whiteboards, pinboards, collaborative learning spaces online, conferences, web sites etc. They need easy and instant access to media systems where they can view materials and share. Learners and leaders need to be able to access appropriate technologies, whether web publishing or interactive whiteboard software.



Questions

*How many classrooms have student whiteboards where they can work in small groups?
How many of us use whiteboards (interactive or traditional) as we interact with our colleagues in meetings?*

So what is the classroom of tomorrow like?

There will be multiple rooms within the one learning space. Small meeting/work rooms attached to a major learning space with an array of facilities (IWB, AV conferencing,

whiteboards, networks and collaborative spaces like tables). These rooms would be used for reflective spaces, planning, meeting, collaborating (face to face and online modes) etc. The main learning space would be a fluid environment - furniture easy to move and manipulate, arrange and rearrange to suite the needs of the task or learning. There will be multiple display systems which are easily linked and controlled, allowing teacher control as well as student connection. Access grids are an example of these.

They will have to be larger spaces than traditional classrooms. Learners will not have individual desks, rather they will have their own storage spaces and operate and learn in the space that suits the task and need they are currently engaged with.



<http://www.uq.edu.au/nextgenerationlearningspace/>

Source: <http://www.uq.edu.au/nextgenerationlearningspace/>

21st Century Learning spaces reflect the audience. They need to be comfortable and appropriate to our learners.

Such facilities are not cheap; Larger spaces, more of them with better facilities and resources, connectivity and capacity. This requires a quantum change in classroom design.

Fundamentally there must also be a change in the direction of teaching too. If such a facility was available in your school, who would use this? Would your teachers be able to adapt to this space or would they revert to a more traditional mode of instruction?

In Conclusion

Welcome to the 21st Century. The rapid advances in technology, linked with reducing cost and increased connectivity are changing our students. They are, for better or for worse, learning in different modes. For teaching to be relevant, for it to be meaningful, teachers must change and adapt. Our curriculum, our teaching practice, our learning spaces and our approaches to technology all must change in the current age.

Resources:

1. Learning space design in 21st Century - <http://net.educause.edu/ir/library/pdf/NLI0446.pdf>
2. 21st Century learning environments for all - <http://www.minedu.govt.nz/index.cfm?layout=document&documentid=12063&data=1>
3. Next generation learning spaces - <http://www.uq.edu.au/nextgenerationlearningspace/>
4. Learning for 21st Century - http://www.medialit.org/reading_room/article580.html
5. 21st Century Learners - and their approaches to learning - <http://ultibase.rmit.edu.au/Articles/sept02/lambert1.htm>
6. Designing spaces for effective learning - http://www.jisc.ac.uk/eli_learningspaces.html
7. Standards for the 21st Century Learner - http://www.ala.org/ala/aasl/aaslproftools/learningstandards/AASL_Learning_Standards_2007.pdf
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