Education for the 21st Century: The Basics

Introduction: Elements of 21st Century Learning

Almost ten years into the 21st century, schools try to promote new ways of teaching and learning and then evaluate how well their efforts have led to results. New insights emerge from research and observation all the time. For example, the Partnership for 21st Century Skills, a non-profit organization, has created a way of looking at teaching and learning today. They have presented six elements of 21st century education and a framework, or vision, for teaching and learning in the 21st century. These elements help us focus on the areas needing change.

This eBook is designed to detail some of the aspects needed for students to learn new things in new ways so they can live and work in a changing world. We begin by identifying the Partnership's framework and then present new thinking on learners, educators, and learning and learning spaces – all by Andrew Churches, a 21st century educator from New Zealand. Finally, we outline new ways of looking at computing for the 21st century. We hope you will find it valuable as you work towards improving education in the 21st century.

Gwen Solomon, Web Director
21st Century Connections

Framework for 21st Century Learning

The Partnership for 21st Century Skills has created a way of looking at teaching and learning today. The elements include focusing on the core subjects, the areas identified in NCLB legislation; 21st century content, the emerging content areas such as: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; and health/wellness awareness. They specifically address learning and thinking skills, including: critical thinking and problem-solving skills; communication; creativity and innovation; collaboration; contextual learning; and information and media literacy.

In addition, students and educators today must have ICT (Information and Communications Technology) literacy and use technology in the context of teaching and

learning. The skills they need include such life skills as leadership, ethics, accountability, personal responsibility, self-direction, and more. In addition, an understanding of how to use 21st century assessments, specifically authentic assessments that measure all areas of learning, is key.

The Partnership's Framework is a unified, collective vision for 21st century learning. Among its elements are the standards, curriculum, environment, and assessments that districts must implement.
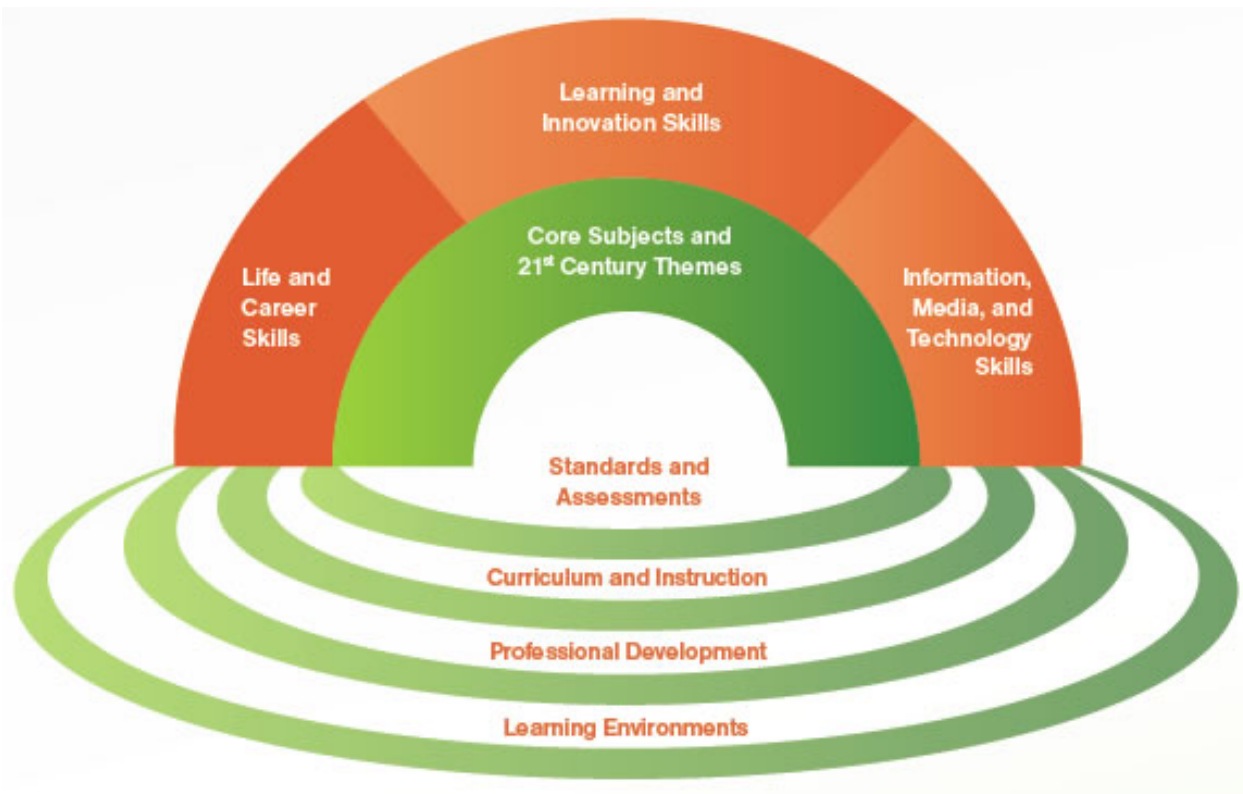
21st Century Standards
- Focuses on 21st century skills, content knowledge and expertise.
- Builds understanding across and among core subjects as well as 21st century interdisciplinary themes.
- Emphasizes deep understanding rather than shallow knowledge.
- Engages students with the real world data, tools, and experts they will encounter in college, on the job, and in life--students learn best when actively engaged in solving meaningful problems.
- Allows for multiple measures of mastery.

21st Century Curriculum & Instruction
- Teaches 21st century skills discretely in the context of core subjects and 21st century interdisciplinary themes.

- Focuses on providing opportunities for applying 21st century skills across content areas and for a competency-based approach to learning.
- Enables innovative learning methods that integrate the use of supportive technologies, inquiry- and problem-based approaches and higher order thinking skills.
- Encourages the integration of community resources beyond school walls.

21st Century Assessment
- Supports a balance of assessments, including high-quality standardized testing along with effective classroom formative and summative assessments.
- Emphasizes useful feedback on student performance that is embedded into everyday learning.
- Requires a balance of technology-enhanced, formative and summative assessments that measure student mastery of 21st century skills.
- Enables development of portfolios of student work that demonstrate mastery of 21st century skills to educators and prospective employers.
- Enables a balanced portfolio of measures to assess the educational system's effectiveness at reaching high levels of student competency in 21st century skills.

21st Century Learning Environments
- Creates learning practices, human support and physical environments that will support the teaching and learning of 21st century skill outcomes.
- Supports professional learning communities that enable educators to collaborate, share best practices and integrate 21st century skills into classroom practice.
- Enables students to learn in relevant, real world 21st century contexts (e.g., through project-based or other applied work).
- Allows equitable access to quality learning tools, technologies and resources
- Provides 21st century architectural and interior designs for group, team and individual learning.
- Supports expanded community and international involvement in learning, both face-to-face and online.

21st Century Learners

Students today are partly shaped by their environment, which is media rich, immediate, fast, engaging, dynamic and instant. It is electronic and digital, a communication medium implying instant gratification.

Native learners (Digital Natives or Neo-Millennial Learners)	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.

*This diagram is based on media exposure for American college students before they finish college. The data is from Marc Prensky's Papers on Digital Natives (*http://edorigami.wikispaces.com/Readings*).*

We give today's learners various labels - Digital Native, Digital Child, Millennial, Neo-Millennial or 21st Century Learner. Through consistent exposure to the factors above and access to a variety of digital media, they are engaged, motivated and learn by the use of digital technologies. They are adept in the use of digital media and are seemingly wired to use these tools.

- By comparison, teachers are mostly Digital Immigrants. This is not meant to be pejorative; rather it is a reflection of how many of us were taught before technology.
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Since the environment in which students learn and play and their exposure and access to digital media are shaping student learning, these factors are also changing teaching.

For teachers to engage and educate, to facilitate and motivate, their methods of teaching must be more closely aligned to students' methods of learning. Teaching spaces must be learning spaces. Teaching tools and resources must support learning strategies. There must be a paradigm shift in education. Teachers must become 21st century learners and 20th century schools must become 21st century learning organizations. Many educators are well on the way.

In summary, we know that 21st century learners are:
● Collaborative, networkers and communicators
● Adaptive and creative

- Information, media and technology savvy
- Partial to instant gratification
- Reliant on media in its various forms

21st Century Educators

What are the characteristics we would expect to see in 21st century educators? They are student-centric andholistic; they are about how to learn as much as about subject areas. They are 21st century learners as well. But teachers are more than this. Below are eight characteristics of a 21st century teacher.

Adaptor

The 21st Century Educator is an adaptor. Harnessed as teachers are to an assessment-focused education model, the 21st century educator must be able to adapt the curriculum and its requirements to teach using digital tools.

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. 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, kinesthetic. It also addresses students who prefer the read/write learning style.

Visionary

The 21st century educator is a visionary. A visionary teacher can look at other people's ideas and approaches and see how they would use these in his or her classes.
He or she also looks across the disciplines and through the curricula and makes links that reinforce and value learning in other areas and leverage other fields to reinforce student learning.

Imagination and adaptability are key, crucial components of the visionary educator of today and tomorrow. The 21st century teacher sees the potential in the emerging tools and web technologies, and then grasps and manipulates them to serve student needs.

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. Educators, 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.

Risk Taker

The 21st century educator takes risks and is prepared to tap into students' knowledge of technology. With a vision of what he or she wants and what the technology can achieve, he or she can identify the goals and facilitate the learning. Educators can have students teach each other. The learning pyramid shows that the highest retention of knowledge comes from teaching others.

Learner

We expect our students to be life-long learners. Educators too must continue to absorb experiences and knowledge and stay current. In subject areas like Information Technology and certainly in many of the sciences, knowledge, understanding and technology are fluid and dynamic. They are evolving and changing. Teachers must

change and learn and adapt as the horizons and landscape changes. The 21st century teacher is a 21st century learner too.

Communicator

The 21st century educator must be a communicator, fluent in tools and technologies that enable communication and collaboration. They must also know how to facilitate communication, stimulate and control it, moderate and manage it.

Model

Teachers model the behaviors they expect from students. There is an expectation that teachers will teach the value of learning. In fact teachers must model that value. For some students, teachers are the most consistent educational element in their lives. They make a huge difference by modeling learning.

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 media, 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
- human values

Leader

The 21st century educator is a leader. Whether a vociferous champion of ICT integration or quiet technology coach, a teacher leads by example. Leadership, like clear goals and objectives, is crucial to the success or failure of 21st century teaching.

The paper, Managing complex change, by Thousand and Villas (http://edorigami.wikispaces.com/Managing+complex+change) shows the elements required to achieve successful change:

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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

21st century teachers play many roles. They must have vision, skills, incentives, the resources and an action plan to educate successfully in the 21st Century. They are the subject experts, often counselors and frequently administrators. The roles that educators play in the 21st century are complex.

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 is absent, the level of integration is impaired.

The Three Factors

The three factors are resources, skills and curriculum and they form an 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 Level of Technology Implementation (LOTI) scale (http://edorigami.wikispaces.com/LOTI).
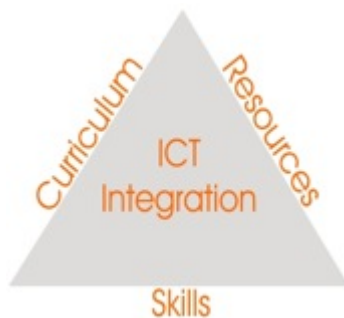
Resources

A classroom fully equipped with the tools and materials is more likely to achieve success than is a poorly resourced one.
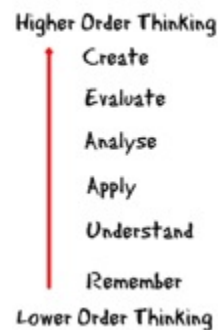
Important resources:
- Interactive whiteboards
- Classroom desktop computers
- Pods of laptops for one to one programs
- PDA's, iPods and cell phones
- Educationally focused software
- Learning and content management systems
- Video and audio conferencing
- Cameras, videos, tripods, microphones, speakers, headphones
- Media production facilities

Coupled with ubiquitous access to high-speed Internet access, these are great enablers of 21st century learning. Of course, the use of these resources for teaching and learning must be tailored to the curriculum. Even with a high level of resourcing, integration is not assured. The two other factors, Skills and Curriculum are critical and must be available in equal quantities. Professional development and time are also resources. Time, a precious and limited resource, is needed for play and experimentation.

Skills

Bloom's Taxonomy

Higher Order Thinking

Create

Evaluate

Analyse

Apply

Understand

Remember

Lower Order Thinking

Skills fall into two categories, pedagogical and technical. Of the two, pedagogical skills are more important. Technical skill, the ability to operate the software and hardware, is second to the ability to teach. Also important is the ability to adapt, adopt and modify, but it is the confidence and competence to teach and facilitate learning through the use of technologies, the combination of the two skills, that is the goal.

A classroom teacher's ability to use a variety of pedagogical strategies is key to integration. A teacher who sees little value in the use of Information and communication technologies limits the level of integration. A teacher with an understanding of 21st century pedagogies, who recognizes 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 technology integration and student learning.

Strengths in technical skills and pedagogy can make up for shortfalls for the other two sides of the integration triangle. A classroom teacher who manages limited resources, structures lessons to enable all students to have access to resources, structures learning for higher order thinking skills so students create, evaluate and analyze, may overcome limited resources.

Curriculum

Levels of Technology Implementation
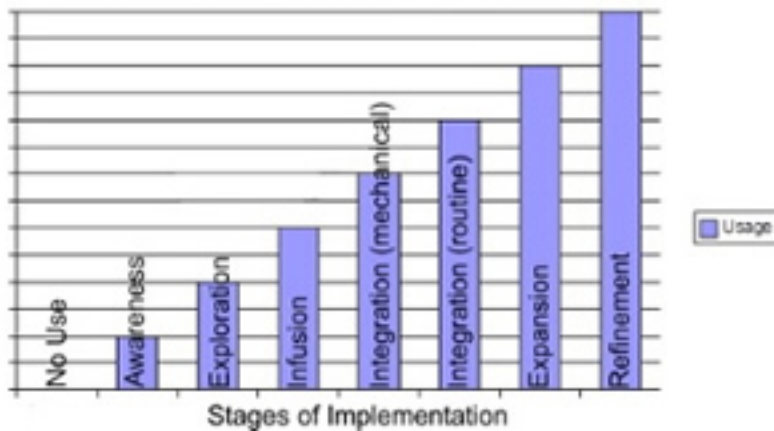
Information and communication technologies are enablers of learning. They are motivating and engaging. We must strive for integration of these tools and technologies and not settle for infusion, just a thin veneer of technology use.

We must ask ourselves:
Does our curriculum reflect 21st century learning?
Are our assessment models reflective of the world in which our students live now as well as in the future?
Do we leverage the teaching of other teachers, build on the skills and processes they teach, and so reinforce our own?

Integrating technology with curriculum and drilling down into subjects is dynamic, exciting and motivating. The use of 21st century technologies should be ubiquitous, inclusive and specific. The selection of tools and resources should be curriculum driven. Integrated units should be reviewed constantly. Teachers and students should contribute to the development and revision of the learning experience so it is student centric. Teaching drives the technology rather than technology driving the teaching.

The curriculum must reflect the world our students will inhabit. Teaching a 20th century curriculum in the 21st century prepares our students for a world that no longer exists. And it is the measure of all three of these factors that results in a high level of technology integration in our classrooms and in our schools.

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.

Many classrooms have improved but too many 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 --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. Our teaching spaces need to match our 21st century learners and teachers.

Our classrooms must have access to technology and media. For example, classrooms should be networked, adequately provided with a rich Internet connection to support media streams, video conferencing/access grid and communications. There should be learning management systems that support anywhere/anytime learning and assessment.

Classroom design

Traditional classrooms are designed for a teacher-centric delivery mode. But 21st century learners are collaborators and communicators. So the classroom must be designed to enable group collaboration. It must have the flexibility for furnishings and technology to be rearranged with ease and speed. The rooms must be able to switch rapidly between individual or group format, 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 as well as space for the class to work together.

The rapid advances in technology, linked with reduced costs and increased connectivity, are changing our students, who are learning new things in new ways. 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 process.

21st Century Computing

Netbooks, a new concept in computing, are designed for 21st century learners. Some companies are designing netbooks especially for education either to complement the larger, full-function notebook PCs, or as entry-level notebooks that allow teachers and students to perform basic computing functions and online activities. They can utilize applications, storage, and any necessary functions through the web. For example, students can search with Google, write blogs with WordPress, join wikis on wikispaces, and perform other tasks with the countless applications available online on their netbooks.

Lenovo designed its IdeaPad S9e and S10e netbook PCs with this in mind. The super-slim, super-small netbooks are ideal for students starting in kindergarten all the way up through high school. Students can use the netbooks tos earch the Web, write blogs and messages, and run basic applications. And at an entry-level price point, they are an affordable option to increase the prevalence of technology in the classroom, especially in 1:1 environments. Focused on education, these netbooks offer choices of operating system, either Microsoft Windows XP Home or Novell Sled 10 Linux, and they offer unique warranty packages.

At and just about one-inch thin with models weighing just over two pounds, the netbooks typify thin and light design, perfect for students' backpacks. To optimize students' computing and learning experience, the IdeaPad S9e and S10e netbooks come with tools such as a built-in web camera for video messaging, and its two USB ports and a 4-in-1 multicard reader make connecting other devices and transferring photos, music and videos easy.

Resources

Partnership for 21st Century Skllls (www.21stcenturyskills.org.)

Andrew Churches, Factors for 21st Century Technology Integration
http://www.21centuryconnections.com/node/538
Blog: http://edorigami.wikispaces.com/

Marc Prenksy, Digital native, Digital Immigrants Parts I and II, NCB University Press,
Vol. 9 No. 5, October 2001 http://edorigami.wikispaces.com/Readings

Dr, Chris Moersch, What is LoTI. http://www.drchrismoersch.com/

Level of Technology Implementation (LOTI) scale
(http://edorigami.wikispaces.com/LOTI)

21st Century Connections web site
http://www.21centuryconnections.com/