Research Question Two

How is ICT use changing the way teachers and administrators approach curriculum delivery?

The impact of ICT on student learning

Much has been written elsewhere regarding ways ICT can be used in the school curriculum and these are not included in this paper, except by way of illustration. My research focused on curriculum practices reflecting fundamental changes in understanding about how the new technologies could support and enhance learning.

The Need For ICT Integration In Schools Recognised

In each of the countries visited, national authorities recognised the need for change to integrate ICT into curriculum delivery. In the USA, IT standards have been produced and in the state of Wisconsin, IT standards have been developed and published directly relating to curriculum standards. Funding differs from state to state e.g. centralised in the LAUSD: government funding supplemented by a private fund-raising for innovation through a Public Education Foundation in Nevada. In the UK, guidelines have been published (IT booklet) although Director of BECTA, Niel McLean stated that OfSted evidence suggests that schools in UK are bimodal regarding ICT. "A significant group (30%) are at the leading edge, there are others who haven't begun to grapple with it at all." Each state visited in Australia demonstrated a commitment to ICT in schools with Victoria and South Australia devoting high levels of funding to support the development of techno-literate graduates.

Research studies have identified the key changes in student learning behaviour attributed to the use of computers, the Internet and other learning technologies.

Researchers Robert Bracewell of McGill University, Therese Laferriere of Laval University and the consulting firm of Reginald Gregoire, Inc collated summary observations and reference points from a wide range of research papers pertaining to the integration in the classroom of information and communication technologies.[46] Their results grouped firstly, around the specific learning achieved, student motivation and the relationship of students to knowledge. Secondly, they grouped

[46] Full paper at http://www.fse.ulaval.ca/fac/tact/fr/html/impactnt.html *The Contribution of New Technologies to Learning and Teaching in Elementary and Secondary Schools*

observations related to the consequences of appropriate use of technologies on the teaching function of teachers, including planning of teaching, intervention with a group of students and the assessment of learning. They identified "participants having knowledge and skill in computer use" as a prerequisite to effective classroom use and noted that many studies researched did not deal with this issue for students or teachers.[47]

Changes in student behaviour attributed to ICT

Their fourteen observations relating to the changes brought about by effective classroom integration of ICT were as follows:

1. The development of various intellectual skills is noted e.g. reasoning and problem solving, learning how to learn and creativity.

2. Specificity of what is learned using the new technologies is broadened and deepened.

3. Students demonstrate a greater spontaneous interest in a learning activity

4. The time and attention devoted to learning activities increases when students use ICT.

5. The ease of access to information sources develops the research spirit.

6. Broader co-operation among individuals within and beyond school is enabled through technologies.

7. The availability of simulation, virtual manipulation, graphic representation and rapid merging of data contributes to linkage in knowledge and leads to more integrated and better-assimilated learning.

8. Teachers gain information on new instructional resources and availability of support for their use much more readily with ICT.

9. Teacher co-operation with others both within and beyond the school when planning activities.

10. The orientation of planning is more towards students performing real work in co-operation with other students.

11. Relationships between teachers and students more interactive and guiding, rather than transferring information from teacher to student.

12. A different vision of teaching and learning; learning seen more as continuous research than a body of facts.

[47] .This is an important pre-service issue for teacher training. New Zealand teachers are currently being encouraged in ICT skill development through the Ministry of Education technology school clusters throughout the country. See also the Navigator Schools' project in Victoria.

13. Assessment of learning uses more demanding methods

14. More effective diagnosing of specific difficulties.

It is of critical importance that changes such as the above be accommodated when planning suitable programmes of learning for 21st Century students.

Curriculum Changes Need to be Planned

Marie Jasinski[48] states:

> *"There are eight defining principles education will have to meet in order to satisfy market demand in the knowledge economy with its convergent technology infrastructure."*

These are:

1. lifelong learning
2. learner-directed learning, with the teacher becoming the facilitator, diagnostician and therapist
3. learning to learn so that individuals can plan and realise their own learning
4. contextualised learning
5. customised learning, designed to meet different needs, preferences and cultural practices
6. transformative learning, enabling the changing of belief systems to overcome disability and disadvantage
7. collaborative/co-operative learning
8. just-in-time learning, as individuals choose from the global *supermarket* of opportunities.

These combine to give a radically changed model of education from last century's teacher-centred schools delivering set curricula, chosen and sequenced by the teacher. Students respond intuitively to technologies that have surrounded them all their lives. For them,

> *"the Internet is instantly interactive and the user can control what happens. It responds to the individual and is an empowering medium that allows them to do things that their teachers don't understand or can't do."*[49]

[48] TAFE, South Australia *Teaching and learning Styles that Facilitate On-Line Learning*
[49] David Campbell. Independent Education, October, 2000

So how far have we come in achieving the desired student-centred classrooms, featuring a range of teaching and learning styles and technologies with 'the teacher's voice one among many'?[50]

Not far enough, is the short answer.

Reasons for Delay in Integration of ICT in Schools

In 2000, a group of New Zealand secondary school staff cited the following reasons for the delay (in no particular order).

- Teachers' lack of ICT qualifications
- too little time to plan and learn the skills effectively
- student anxiety to learn only what would be tested in examinations
- lack of money leading to limited access to computers
- expensive software
- timetable restrictions
- lack of creativity
- limited availability of equipment such as data projectors
- unwillingness to change
- difficulty in linking ICT to the curriculum
- needing IT facilities in classrooms rather than laboratories

Equity issues were identified as an inhibitor in some states in the USA as it was held unfair to promote the activities of one particular school until all schools had the connectivity and ability to benefit from an IT programme. Consequently, while IT enthusiasts celebrated the work of individuals and visionary schools, they felt frustrated that similar initiatives could not proceed state-wide.

The Use of ICT is Changing the Ways Schools Operate

Changes are occurring, however and these will be discussed under the following headings:

1. Rethinking The Timetable
2. Growth Of On-Line Learning
3. Rethinking What Is Being Taught
4. Real-Life Learning Experiences
5. Teachers Collaborating To Share And Develop Expertise

[50] Paul Butler , Caulfield Grammar, Melbourne

Rethinking the timetable

Debunking myths about timetabling

Niel McLean,[51] applauds the schools using IT tools to enable the kind of **data collection that helps schools make informed decisions and choices**. "For example, there is a myth that you can't have double Mathematics on a Friday afternoon – but is this so? How do we know? Tracking test scores to find out if there is a significant difference is now possible because this myth is a timetable constraint that is not necessarily true." Schools can now be **more flexible with timetabling and school organisation. To measure effectiveness**, data can be collected after changes and tracked. Schools are receiving much quicker and more reliable feedback with IT.

Do all subjects need to be timetabled?

MLC, Sydney reviewed subjects being taught and identified **Music** as one that could be **tailored to meet the needs of students without being timetabled** in the regular way. Excellent facilities are available to students and all music is taught on a contract basis rather than permanent staff basis.

Staff mapped the Music curriculum, outlining the **key competencies** in each area of the course - aural, musicology, composition, performance. They created **a grid of these and tasks and assessments** for each outcome.

Most music teachers do not have classroom lessons. Years 9, 10 and 11 Music is scheduled at same time and if a student or students need class contact, they get it. Music is still on students' individual timetables and there is a Year 9, 10, 11 Resource person for each group of students. Students log on to "Trackit" where tasks and assessments are recorded. There is a composer in residence who gives student time; student performances, including **all extra curricular activities**, have been **brought into the curriculum and gain credit**.

Breaking out of the timetable "straitjacket"

In the **Year 7 and 8** area, MLC, Sydney, have created a **more flexible timetable to provide a "line day" every second Tuesday**. Every department wanting to be involved gives one period a week so **that every 6 weeks they gain a full day for that subject** e.g. English, Humanities.

[51] BECTA, UK

There are two compulsory staff team meetings per week; the Mathematics Department opted out of line day so Maths lessons are not scheduled for a Tuesday. Because Languages have only two classes per week, they do not give up a period for line day. All exams to be held on Tuesdays (no home room times on Tuesday)

Line Day has lead to **more flexibility, more project - based study** and the extended time of Line Day encourages teachers to plan time use effectively.

At Leosowes, UK, every Friday is a **Flexi-Friday**, **where one subject is studied from 8.30 am until 1.30 p.**m. For example, on the English Flexi-Friday, classes created *Romeo and Juliet* storyboards using the digital camera; they found sites within the school to stage scenes from the play and recorded their performances. PowerPoint presentations then made with pictures, text and sound.

Worth, West Sussex have a **Learning Together Day** where the timetable is collapsed on a regular basis to allow Year 9 and 10 students to participate in a lot of different learning activities, relating to learning needs. E.g. juggling, mindmaps, time management, memory development, miming and higher order thinking skills.

Advanced Technologies Academy was established 5 years ago with a clear technological vision "which teachers are coming to terms with".[52] Traditional timetabling was holding back achieving the IT vision for the school so, to overcome these drawbacks, the school now **operates on 8 classes a day for three days with a block schedule for 2 days**: 6.45 am until 2.05 each day.

To create more flexibility for students, classes in the Oregon School District High School are scheduled in **90-minute blocks, with five teachers allocated to one hundred and twenty-five students**. This allows for more creative approaches in curriculum delivery and requires advanced planning to ensure that the needs of students are being met. All school organisation is based around the House concept.

Growth of on-line learning

Web-Based Courses

A key area of rapid growth has been that of on-line learning, both in web-hosted environments and in packaged form on CD. The use of **web-based courses** is **proliferating** in Australia and the USA. Schools are providing wider curriculum choices and more individualised programmes through the use of web courses; home-based students of all ages are now able to choose courses and gain qualifications from a widening range of organisations.

[52] Principal, Michael Kinnaird www.atech.ccsd.k12.nv.us

www.ultralab.net, www.notschool.com and www.vsg.edu.au are examples of web-hosted, virtual classrooms where the students may be distant from the teacher and resources.

Curtin University, Western Australia[53] has developed a comprehensive offering of on-line courses, qualifications and resources for educators.

Consortia of Schools

Co-operative ventures between schools are being developed e.g. Florida High School[54] and The Concord Consortium, in New England,[43] where a consortium of 10 school districts has combined to create a virtual school. Each agrees to provide a teacher and can enrol students in proportion to the number of teachers provided.

Rupert Murdoch's News Corporation announced[55] "a joint venture with eighteen leading universities to tap the global higher education market. This consortium, called **Universitas 21**, includes the University of Melbourne, University of Queensland and University of New South Wales, and it represents … the **birth of a private, global, virtual university** controlled by News Corporation, which will purchase and deliver course content via its Internet, interactive satellite and television services."

Technical Colleges **in the USA are creating** virtual high schools for practical subjects where they find it difficult to get teachers, and for advanced placement courses**. The models range from Correspondence School on-line to a project-based method of delivery where a co-ordinator checks on students once a week to see how work is proceeding.**

Powerful School Intranets

Bendigo Senior Secondary College, Victoria is working with a software group to develop Year 12 certificate courses on-line. Twenty of these VCE[56] courses have been prepared, **supplemented by courseware on CD**. See www.xsiq.com. This company also has certificate subjects for New South Wales and Queensland.

Staff at Netherhall Secondary School, Cambridge [57] developed **CD resources** that are now being put **on the web**. They are also involved in a **digital TV trial involving 100 families** which increases the interactivity possible for students studying from home.

[53] www.curtin.edu.au
[54] http://fhs.net Florida High School
[43] http://vhs.concord.org
[55] *Education Age* 31.4.2000, Australia
[56] Victoria Certificate of Education, Australia
[57] ICT Coordinator, Alistair Wells; www.netherhall.cambs.sch.uk

OAC, Open Access College, Adelaide, is a distance education community with the school complex based at Marden. **A range of technologies is used to deliver the curriculum: print-based, video, interactive CD, interactive conferencing screens with on-line audio-conferencing taking place through the telephone for one-on-one or more students to a teacher**. The multimedia production suite employs 11 people producing interactive CD resources as well as contract work for community organisations. **Careful analysis takes place as to which aspects of the curriculum are best suited to each medium for teaching and learning** eg for teaching graphing to two students, the interactive screen and coloured "pens" were used so that the teacher could see what each student drew in response to the conversation.

Further web addresses for on-line learning institutions are provided in the Appendix.

Rethinking what is being taught

Authentic contexts

Teachers in schools using ICT effectively, soon find that much of **the repetitive "busy work" and unreal, contrived exercises are no longer relevant** in an environment that allows students direct access to engaging information sources. This realisation has led to new approaches being made to curriculum content and the encouragement of information literacy skills development. Students are being encouraged to use higher order thinking and given strategies for powerful learning in this new environment.[58]

Using Higher Order Thinking Skills

At John Paul College, Queensland, strong school policies regarding the integration of IT and research in the curriculum have seen a greater emphasis on digital presentations; these have lifted senior scores and oral communication considerably. **The "hunting and gathering" side of research has been closed down resulting in much more analysis and synthesis of information.**[59] All **assignments Years 8 – 12** have to be submitted to HIS who checks **resources available, higher order thinking content and ICT content** prior to approval being given. She thus has a global picture of what students are studying; works closely with academic staff and Director of IT. Redesigning activities for digital form has been challenging and began with Social Sciences.

Because of IT projects in junior schools, **the exercise book size has been changed to A4 with lines on one page and plain on next**, printed

[58] An excellent New Zealand primary school example of ICT integration can be seen at www.tahatai.school.nz

[59] Head of Information Services, Kerryl Fleming

especially for JPC. This allows the seamless integration of handwriting and desktop publishing.

Revising course materials for on-line learning

For publication on the **school Intranet**, what is being taught has been reviewed and rewritten by staff. Students can access the curriculum and find sections entitled: Essential learning: Basic ideas, Themes, Assessments (self-assessments, major assessments), Concepts and Concept Checks, What is being taught, Required Assignments, Useful resources, Key information and ideas, Things to follow up and Extension.

Providing Structures for Learning with ICT

At Worth School, Sussex, a **strategy sheet** is now used by all students for longer assignments with the aim being to **structure students' thinking** and encourage them to **evaluate the best methods** for approaching a task (which may not involve computer use).

Marco Torres[60] requires teachers to complete planning guides prior to using learning technologies. They match their tasks with ICT and curriculum objectives and must include HOTS[61] components in their tasks.

Promoting Powerful Learning

Staff members at Glen Waverley Secondary College, Bendigo, use computer technology to support Teaching and Learning. There has been an **unequivocal focus on theories of learning, brain research, powerful learning, learning to learn, metacognition, visual organisers and other thinking strategies**. Principal Darrell Fraser's keynote entitled *Thinking and Learning Skills: the last Hurrah?* explored the essential ingredients in creating and sustaining a learning community based on **defining the Thinking Curriculum**.

The school mission is **Developing Autonomous Learners**. Do we teach them to be autonomous? What do they need to be able to do? What is powerful learning and how do we enable students to develop the skills to be powerful in learning? How do we promote it?

To promote a thoughtful classroom, teachers have been trained in strategies to **foster metacognitive processes, to learn and apply critical thinking skills and use the language of metacognition.**

GWSC ran a *Learning to Learn* programme for Years 7 to 9 with a Teaching and Learning coach supporting staff to make the changes needed to focus more clearly on thoughtful classrooms. There **is school wide use of thinking "scaffolds" and organisers**. **For one semester, each class**

[60] Apple Educator of the Year, 2000
[61] Higher Order Thinking Skills

was withdrawn for 20 lessons (100 minutes a week), the aim being to move from **Thinking Skills to Thinking Classrooms.** [62]

All staff also went through the course so that there was a shared understanding of what the terms meant – e.g. metacognition, co-operative learning, etc

"Just in time" learning not "Just in case"

At the Technology School of the Future, Adelaide [63]Sue Hollands conducted research - 4MAT[64] - into the effects IT has on Mathematics teaching. IT enables "**Just in time" teaching rather than "just in case" teaching**. It is important that students gain the "big ideas/issues" in Maths, not just disconnected skills.

> *"Maths will encounter the most radical changes through technology use: Some Maths will be more important, some will be less important and some will become possible: Henry Pollak".* Quoted by Sue Hollands at ACEC conference, 2000.

Providing real-life learning experiences

Advanced Technologies Academy, Nevada has a **Business Applications Classroom set up like a corporate office.** Entrepreneurship, accounting, the use of business laptops, fax, copier, phones are taught.. The room is divided into office cubicles, round meeting tables and a board table. The school also has a **partnership with Metro crime Laboratory for their Criminalistics course.** They were given a $100,000 ballistics matching machine; students study crime scenes and collect data on fingerprints and forensics.

Digital design students undertake commercial projects for the Las Vegas business community.

Gold and silver mining is an important part of the history of Nevada. Five years ago, two teachers at Gordon McCaw Elementary School, Henderson, Nevada[65], asked permission to build a papier mache mine tunnel in the classroom, to give the children an idea what it would be like to be a miner. The idea grew and now the school has built a **full-sized Silver Mine complex.** Full-sized tunnels have been created with displays depicting the mining process and teaching areas. These comprise a Geology room, fossil dig, antique equipment displayed with modern technology. Animated figures explain the stories for the children e.g. the origins of the terms,Tommy-knockers and the horse-shoe.

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[62] *Thinking About Thinking* excerpt from Fogarty 1997 and other sheets

[63] Paper delivered at NavCon 2000, Bendigo Senior Secondary College

[64] Documentation available. Outline of a collaborative research project with all the planning documents, topics and approaches, skills and marking schedules. http://www.tsof.edu.au/LT.SA

[65] Principal: Janet Dowbry

A group of senior citizens form the volunteer force to operate the **free field trips other schools make to the facility** each year. **Teaching resources are available on the Nevada school district network.** Teachers bringing classes on field trips, come in for a day of training and preparing resources. Once they have completed the day's training, they can book a field trip.[66] **Grade 4 and 5 students are tour guides one day in 20 weeks** and train with the senior citizens. Nevada history is in the Grade Four curriculum. Other community partnerships include speakers at Geology or mineral seminars, University of Nevada-Reno, McCaw School of Mines, people who mine crystals will put pictures on the web and are available to answer the students' questions.

A CD of the McCaw Silver mine and other similar school-based field trip initiatives **(Marine Laboratory at McDougall, Whitney Mesa nature trail**.; Vandenberger **Biosphere, dome built over courtyard;** Lammas farm) has been prepared by Clark County School District.[67]

The Clark County School District assigns .5 of a teacher's time to the Marine Laboratory and Nature Trail.

The world-wide **Jason Project,** which invites young scientists to participate virtually in research of interest, this year is studying volcanoes in Hawaii. Students are encouraged to become involved and are prepared so they will have plenty of interesting questions to ask. Nevada puts 19,000 students through the Jason Project.

Students at Netherhall, UK, go on **virtual fieldtrips** around the world, preparing visual stories so they can communicate without language (e.g. students in Prague; Chemistry exploring atmosphere of Venus and using research to test spacecraft materials in the laboratory.)

The **use of on-line experts** at Netherhall, UK, enhances the curriculum for students. Emails sent out to the school family resulted in the identification of over 30 people expert in their fields who are willing to respond to questions posed by pupils (Head of Astronomy, footballer, dietitian, head gardener, voice recognition specialist et al.)

At Marshfield, Wisconsin, a group of students were taken **on journey up the river in birchbark canoes, retracing the voyages of 1790's**. They studied the original journals of the time (from the web) and students made multi-media presentations www.marshfield.k12.wi.us/socsci.html Also followed this format when students studied WW2, interviewed veterans and created their presentations. [Same website with /WW2 extension].

At LAUSD, Joe Oliver who visited JPL (Jet Propulsion Lab) and the Planetary Society developed the **Mars Rover Project** at the time of the Mars landing. Teachers in different schools signed up to take part. Building and operating the Rover has to be an integral part of the curriculum in Science and Maths (calibrating the Rover, Cartesian co-ordinates, physical sciences etc).

[66] Supporting materials and slide show available. CD of other field trip sites at elementary schools.
[67] Copy given to the author

Doing the project meets curriculum goals and satisfies appropriate standards for Grade 6, 7 and 8 level.

Each school dedicates an 8' by 8' space to be used by the Rover and builds the robot which has a video camera on top of it (operated by laptop). Then these are collected and redistributed to schools unknown to the makers. The task then is to create a map of the new area through processing the image data gained from the Rover. Students have to work as a team to enable sense to be made of the data. A Laptop computer is used for co-ordinating the image data and students have to deal with any breakdown problems as if they are fixing them from Earth.

Teachers collaborating to share and develop expertise

In each of the areas visited, teachers had the opportunity to meet and collaborate virtually through shared networks and web-spaces. These co-operative sharing and learning communities are transforming the way teachers work and their attitudes towards sharing and learning from each other.

In addition to the government provided virtual meeting places, individual schools, universities, philanthropic foundations and commercial enterprises are creating ways for educators and IT specialists to interact and collaborate.

In a time of rapidly advancing use of information and communication technologies, the old model of an individual teacher isolated in the classroom has gone. For students and teachers to effectively participate in, and benefit from, the global learning community, each needs now to reach out and share in the on-line opportunities available.[68]

[68] See Appendix 1 for selection of sites

Conclusion

Throughout my study, there were visionaries, be they teachers, ICT co-ordinators, school heads or administrators in government roles, creating learning opportunities for students using ICT. Strategies for encouraging (or requiring) whole staff take-up of integrated curriculum use of ICT, features in the two to five year plans of almost all schools and education districts visited.

> *"The terrifying thing about this technology is what it tells us about the rate at which children learn"*, Jenny Noel-Storr, Redhill Primary School, Shropshire.

Once ICT becomes an integral part of student learning, teaching styles and classroom organisation cannot remain unchanged.

The Future of Schools

William West[69] sees the future Australian student as

> *" … one who may spend a few hours in a neighbourhood learning centre, primarily to help pick up social, sporting and cultural skills but possibly for some teaching and tutoring in certain subjects. This input could be followed by online tuition, possibly from home, with tutors drawn from all over the country or the world. The student might then log on to research his or her latest project, drawing on the latest information from the world's leading libraries and research institutes". The staff in this scenario will be more diverse, with a greater emphasis on specialisation."*

During a panel discussion in July 2000[70], key features of schools in the future were identified as including:

- downsizing from overlarge schools
- collaborative endeavours will become more common among schools and districts
- there will be a greater emphasis on communication, community and creativity for high, value-added organisations
- "the right connections and the right tools" become more important, emphasising the need for effective technologies

[69] Education Review, Australia, March 2000

[70] ACEC, Melbourne. Speakers Stephen Heppell, Bernard Hollkner, Sue McNamara, Lynne Schrum

- interactive, asynchronous discourse becomes an important learning method
- simulations and virtual field trips become more common
- schools must recognise the need for authentic learning and that it cannot be assessed in old ways or against "old" criteria;
- students will spend less time on campus
- formalised relationships with experts will develop beyond school
- the learning process becomes dynamic, exciting and fun using technology to learn in ways never before possible.

There will also be a continuing focus on ways ICT can streamline administrative tasks, giving students 24-hour access to learning resources.

Countries promoting developing ICT usage and integration to a higher level and most effectively to date, have been those with the most need to connect to information and institutions e.g. to quote Bill Wiecking, "technology reaches over dangerous stuff like sea and desert for Maui and New Mexico." In Australia and New Zealand, too, both long distances from Europe, Asia and the Americas, there have been real advantages in connecting communities nationally and internationally. It is no surprise then to find that best practice ICT use in schools and institutions with geographic barriers to overcome, appear to be ahead of counterparts in other areas studied in this research.

It has also been noted that where rigorous examination systems and prescribed learning outcomes control the curriculum, it is much harder for innovative use of technology in the curriculum to occur. While creative use of ICT has been observed in all schools visited, more timetable flexibility has been implemented in elementary (primary) schools and in states in Australia and USA where national external examinations do not dominate curriculum delivery, e.g. Queensland.

Information and communication technologies are beginning to have an impact on curriculum and classroom redesign in each of the four countries visited. The use of the information gained during this research will drive organisations and individuals towards differing solutions in response to the needs of their students and learning communities. Significant changes involving ICT are planned for in all regions over the coming five years and it is important that educators and administrators collaborate and learn from the mistakes, discoveries and best practice from other schools and researchers. There is much to learn from each other and much to gain for students.

> *Technology is driving the future. The steering is up to us*
> *(Seen in LAUSD IT office)*

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International Society for Technology in Education and U.S Department of Education *National Educational Technology Standards for Students: Connecting Curriculum and Technology*, USA 2000

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Los Angeles Unified School District Board of Education: *Online Literacy Resource (CD) Version 1. USA*

National Business Education Alliance: *Technology Use Profile, State of Wisconsin*, 28.6.2000

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Wisconsin Department of Public Instruction *Technology Literacy Challenge Fund: IASA Title III – Technology FY 1999 Wisconsin summary of Projects*

Wisconsin's Model Academic Standards (CD*) Raising the Bar for all Students,* April 1999

Wisconsin Department of Public Instruction *Wisconsin Educational Technology Plan PK – 12, 1996 (Revised 2000)*

Appendix 1

Supplementary website addresses

UNITED STATES OF AMERICA

www.att.com/learningnetwork AT & T Learning Network. Resources, ListServs, Virtual Academy, professional development, On-line journal et al

www.highwired.net Global High School community; free web building and hosting service; classroom section; tutorials, collaborative, web-based projects

www.mff.org/edtech Education area of the Milken Family Foundation website. Articles and downloads re learning technologies and on-line learning environments

www.virtualhighschool.com Ontario secondary school, advice for parents

http://fhs.net Florida Virtual High School

www.cyberschool.k12.or.us students around the world taught entirely over the internet; includes interactive textbooks with text, audio and video

http://online.usu.edu Utah State University distance education course. Excellent resources for students

www.scholars.com/scholars.asp On-line advisors mentor students 24 hours a day, courseware

www.glef.org George Lucas Education Foundation, K-12 media materials and website.

http://www.nettech.org/tc/common/listservs.html Listservs for Information technology co-ordinators

www.newtechhigh.com Virtual High School, California

www.cpsr.org/home.html Computer Professionals concerned about the impact of computers on society. Essays, newsletters, competitions et al

www.paly.net Digital School, Palo Alto High School

www.ccsd.net Clark County School District, Nevada

www.ccpef.org Clark County Public Education Foundation

IBM REFERENCES

http://ceoforum.org

www.ibm.com/au

www.lotus.com/learningspace

UNITED KINGDOM

www.teachthinking.com

UK project site used by Glen Waverley Secondary College

http://news.bbc.co.uk

www.the-educator.co.uk On-line magazine for educators, curriculum outlines and resources, assessment tools

www.englishonline.co.uk

www.mathsonlune.co.uk

www.virtualschool.co.uk Curriculum sent by e-mail, targeted at parents

www.standards.dfee.gov.uk/thinking

Dr Carol McGuiness *From Thinking Skills to Thinking Classrooms*

www.ultralab.ac.uk

Professor Stephen Heppell's research and activities here. Also: notschool.com the virtual school set up for second chance students with Uni students and adult experts (often retired) as mentors.

http://www.ecis.org/it/Index.htm Information Technology Resources for International educators

CANADA

http://olt-bta.hrdc-drhc.gc.ca/info/eljoue.html Electronic Journals related to Learning Technologies

AUSTRALIAN SITES

www.edna.edu.au/EdNA Education Network of Australia. Excellent on-line discussions for teachers, resources, information

http://education.qld.gov.au Virtual School pilot where students log on and attend "real time" classes and interact with the teacher via voice or software applications.

www.worldschool.com learning resources, tutor for homework assistance, QMAT's (questions, models for an answer and tips) Infobank, Wordbank, Linkbank (thousands of other useful sites)

www.ngs.com.au Net Grammar School, soon to be opened in Sydney

www.xsiq.com Interactive curriculum modules for students, supported by use of multimedia CD's

http://www.tsof.edu.au/LT.SA (learning technologies/teaching plans)

www.linkideas.com (teaching ideas)

http://education.3COM/netprep (course for students)

www.vsg.edu.au (virtual school for the gifted)

NEW ZEALAND SITES mentioned in paper

www.tki.org.nz New Zealand Ministry of Education portal for educators

www.minedu.govt.nz New Zealand Ministry of Education website

www.marsden.school.nz Website address of Samuel Marsden Collegiate School, Wellington, New Zealand.

www.kingscollege.school.nz Kings College, Auckland, offering on-line courses for distance students.

www.tahatai.school.nz Innovative primary school established as an IT school

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