

ICT in Arts Education

A Literature Review

by

Merryn Dunmill and Azra Arslanagic

of

**Te Puna Puoru National Centre for Research in Music
Education and Sound Arts, University of Canterbury,
New Zealand**

Commissioned by the New Zealand Ministry of Education

July 2006

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Acknowledgements

The researchers thank the staff at the University of Canterbury Library and the University of Canterbury Research Office for their support and guidance. The researchers also thank the Ministry of Education for commissioning this literature review to support future developments in use of ICT in arts education.

Opinions expressed in this report are those of the authors and do not necessarily coincide with those of the Ministry of Education.

Preamble: This literature review is focused on New Zealand and international studies of information and communication technologies (ICT) that enhance arts teaching and learning outcomes. It is intended for an audience of policy makers, professional development facilitators, teachers, and researchers.

Executive Summary

The purpose of this literature review is to source and discuss relevant information about effective utilisation of Information and Communication Technologies (ICT) in arts education (dance, drama, music and visual arts). This report is intended to inform future directions for the use of ICT in arts education in New Zealand.

This literature review addresses the following overarching questions, as identified by the New Zealand Ministry of Education:

- What does the research tell us about teaching practices using ICT that make a positive difference for learners in the arts?
- What evidence is there of improved outcomes (educational, cultural, social and economic) through the effective use of ICT in arts education?

The potential of the use of ICT in arts education in the New Zealand context is noted to be in its early stages of development and only partially realised. There is, therefore, little research published about the use and effects of ICT specifically in dance, drama, music, and visual arts education in New Zealand settings. At the time of this review, no New Zealand-based robust print or online literature has been able to be sourced that generically considers ICT in arts teaching and learning contexts. Some New Zealand print and online materials that have been published, such as the 'ICT learning experiences' on Te Kete Ipurangi (the Ministry of Education website), describe specific arts discipline learning contexts that use ICT. However, there is little research evidence to accompany

these ICT experiences and support the findings of improved learning outcomes in the arts through the effective use of ICT in arts education.

Over the past decade, and similar to developments in other countries, New Zealand has developed ICT policies and commissioned evaluative reports on the impact of technologies in schools. These do not report on the impact of ICT on arts education but rather, the use of ICT in quality teaching and in generic learning with a focus on student engagement and motivation, and on raising teachers' digital literacy. Similarly, there is as yet very little robust international research on student achievement in the arts, per se, in relation to the use of ICT, nor on the impact of ICT on the wider social, cultural and economic aspects of arts education. International literature explored for this review on the impact of ICT on student learning in arts education, has largely been sourced within studies of creativity – a key education focus for the 21st century. Reviewed studies carried out on ICT in curricula have provided scant information relating to the arts and, where discipline-specific studies have been located, they are in music/sonic arts, and visual arts discipline contexts. Dance and drama still do not feature in the literature relating to improved learning outcomes through effective use of ICT in learning and teaching.

This review therefore describes currently available New Zealand examples of ICT learning experiences that involve arts practices, and considers international studies that relate to examples of ICT teaching and learning in arts contexts. The studies searched for this review (including examples of effective ICT practice in arts contexts), are largely from the United Kingdom and Australia as these education systems are more closely aligned with New Zealand education than with the curricula of other countries. Links are drawn and conclusions summarise key findings in relation to the research questions that were determined for this literature review. Recommendations are provided for key stakeholders in New Zealand educational settings, and may be of interest to partner arts organisations.

Summary of Findings

The findings of this review are summarised below based on the structure of the main body of the report. Four sections define key information relating to the areas of ICT and to the learning area - The Arts. The sections are: Arts in Education; ICT in Education; ICT in Creative Arts Contexts; Conclusions.

Arts in Education

The arts are defined differently in international curriculum documentation. Hence they differ in educational practice and in studies related to arts praxis. Since 2000, New Zealand has implemented a national curriculum in the arts with four distinct disciplines of dance, drama, music and visual arts. These four arts disciplines are linked by four generic and interrelating strands, but the achievement objectives describing the eight progressive levels in each of these strands are specific to each unique discipline. New Zealand arts education also has a uniquely separate and independent Māori document, *Ngā Toi i roto i Te Marautanga o Aotearoa*, written for and by Māori (2000). The Ngā Toi curriculum statement identifies three arts disciplines articulated as Toi Puoro (Musical/Sound Arts); Ngā Mahi a te Rēhia (Performing Arts); and Toi Ataata (Visual Arts).

In New South Wales, Australia, the disciplines for arts education are defined as dance, drama, music and visual arts as in New Zealand, while in Queensland, the same disciplines are joined by a fifth discipline - media. England defines the arts in education as art and design and music, while in Scotland arts disciplines are located separately under the umbrella title, expressive arts. In addition, in the United Kingdom there is a significant educational movement in music education toward sonic arts/sound arts practices that embrace ICT.

In 2006 a new draft curriculum for New Zealand is being developed. The learning area Arts retains the four arts disciplines but with modifications to the achievement objectives which now make more reference to utilisation of relevant technologies. However, there

are no specific ICT objectives for each discipline as in some Australian states arts curricula, e.g. New South Wales. The New Zealand draft curriculum identifies five key competencies that may be readily demonstrated in arts practices and ICT collaborations: managing self; relating to others; participating and contributing; thinking; using language, symbols, and texts. These key competencies, as core outcomes of education that we want our students engaging in, may form the basis of further research in ICT and arts education in years to come.

ICT in Education

ICT as a term encompasses a range of human-devised hardware, software and telecommunications technologies that facilitate communication and sharing of information across boundaries and which may be used to generate arts experiences and objects. In order to best utilise ICT, digital and information literacies are required to access and utilise e-learning and online materials, and to appropriately select and operate digital materials and technologies. To this end, governments around the world are developing digital strategies to support education in the 21st century. The focus of these strategies is to enable countries to realise their economic, social and cultural capital; to keep pace with rising expectations and technological advancements; to develop creative, thinking people who can solve problems in new ways and within multi-dimensional learning environments.

Literature from Australia (Newhouse, 2002) and the United Kingdom (Loveless, 2002) provides evidence that ICT positively impacts on student achievement in core subjects, including evidence that specifically relates to the use of music and visual arts to enhance learning processes and outcomes. Findings assert that both the learning environment and curriculum pedagogy and content are central to the effective use of ICT. However, teachers need to be confident in their subject knowledge as well as in basic ICT literacies so that they can effectively integrate ICT into teaching programmes. A large number of studies have found that students are often more engaged and motivated to learn when using relevant ICT to support specific intentional learning. Unintentional learning can be

identified and is often beneficial to wider learning but research has not yet investigated this in any depth (and not in any arts education contexts).

Studies from the United Kingdom and Australia often conclude that teachers need to plan for the integration of ICT into teaching and learning programmes to cater for individual students' needs and the selection of quality digital material. To this end, studies on the impact of ICT on teaching have noted the need for new pedagogies to cater for the dynamic and chaotic learning that can take place as students steer their own learning in areas of need and interest, as found in New Zealand research on student learning in the arts (Holland & O'Connor, 2004). All ICT in education studies note the need for teachers to be provided with professional support to integrate ICT into programmes of learning – particularly regarding technical, practical, pedagogical, infrastructure, and school management aspects.

In New Zealand, research by the Education Review Office (2005) has shown that ICT use in schools is uneven and low in arts classrooms compared with other learning areas. Barriers identified by research participants include lack of reliable internet access, and insufficient professional and technical support to embed ICT into programmes of learning, not just as tools, but as planned opportunities to improve engagement and achievement. In New Zealand and other researched countries, there is little data on the impact of ICT in arts praxis. One study, *An Evaluation of Arts Professional Development Online in Support of the Arts in the New Zealand Curriculum* (Ministry of Education, 2002), briefly reports that the online professional materials and online facilitator support provided by the Arts Online website (Ministry of Education) improved arts planning and classroom practice, and hence outcomes for students. No other studies are available on the impact of online professional support for arts education in New Zealand contexts – in either educational or in community settings. The Arts Online continues to provide online support for arts educators in all sectors by providing discipline-specific interactive listservs, units and lessons, resources and site links, professional readings, events and community links, interactive planning, newsletters and facilitated individual subject support.

For the first time in New Zealand, national research initiatives to support effective utilisation of ICT in arts programmes are taking place in 2006. These projects involve *Scoping for Future Provision of Digital Resources to Support the Arts* – searching, reviewing and evaluating digital resources for the arts disciplines of dance, drama, music and visual arts; and *Professional Development to Enhance Learning in Arts through Effective Use of ICT* - an in-school facilitated development project that supports teachers in a small number of New Zealand primary schools in the re-purposing of selected digital assets and learning objects for enhanced learning outcomes in music and visual arts. It is expected that this literature review will support these projects by drawing conclusions and making recommendations to key stakeholders for further developments in ICT and arts learning and teaching in New Zealand education contexts.

ICT in Creative Arts Contexts

New Zealand has a growing range of digital assets, and online resources to support teachers to more effectively teach the arts. There is cognisance by government agencies of the need for growth of interactive sites for students and teachers to support collaborations across New Zealand and eventually in global settings. One example of this is The Le@rning Federation (TLF) initiative, a collaboration between the governments of New Zealand and Australia. The project aims is to develop thousands of items of online digital content (assets and learning objects) to support the curriculum (years 1 – 11). The Ministry provides access to this content via Digistore (<http://www.tki.org.nz/r/digistore/>) & encourages teachers to feedback on their uptake and use. Results are published in the Freebody reports available at

<http://www.thelearningfederation.edu.au/tlf2/showMe.asp?nodeID=891>. There are however comparatively fewer objects that focus on arts learning (although there are around thirty-four that potentially link to arts learning) and these are located under the area *Innovation, enterprise and creativity learning objects*, under Arts (music and visual arts) and Technology: Sonic (with three subseries – Sonic space, Sonic time and Sonic motion for years 6 – 10); and Creativity: Fifi Colston (based on creating wearable arts for years 7 – 10). The Australian trials (Freebody, 2006) did not report on the utilisation of

arts learning objects and therefore there is no reporting from these trials on the likely impact on teaching and learning in the arts.

By using another lens on ICT in relation to arts education, the literature on creativity and ICT provides information on how creative arts practices can be promoted, extended, shared and presented with the use of new ICT. 3D virtual technologies have the capability to change arts practices through transdiscipline, multidimensional, creative interactivity in both real-time and imagined worlds. Initiatives in the United Kingdom, Australia and the United States of America, for example, show exciting developments in arts-based projects that effectively integrate a range of sophisticated, multi-dimensional technological tools. In addition, projects that connect students across places and cultures are seen to be particularly powerful in supporting indigenous groups to affirm their identity in the global community.

Of importance to New Zealand arts education is the rapidly growing international trend towards establishing online relationships between community arts and artists, and classroom arts programmes for both teachers and their students. These are proving to be very successful in reviewed examples where mentors and community artists work in collaboration with schools in online environments to enhance student learning. Where these partnerships are operating successfully (both nationally and globally), benefits are noted and these include greater social cohesion and cultural exchange for improved understanding between peoples of the world. Economic benefits grow from such artistic partnerships where the ongoing development of creative thinking artists of the future supports 'talent meritocracy' (versus 'exam meritocracy') and potentially develops 'top-ranked scientists, entrepreneurs, inventors, business executives or academics'. (Zakaria, 2006) As evidenced in international studies cited in this review, social, cultural and educational engagement between communities of practice are exemplified in online and e-learning projects where the use of even older technologies such as video-conferencing, are playing a key role in mentoring in the arts (for teachers and for students) for enhanced learning and teaching.

Conclusions

ICT in arts programmes, as in other learning areas, can enhance both student and teacher motivation. In order for ICT to impact most effectively on traditional school-based arts learning and teaching, educators need to critically review available digital multimedia to assess advantages and disadvantages so that selection and utilization of digital resources and objects best meet the needs of particular students and learning contexts, thereby supporting engagement, motivation and quality learning experiences. Teachers need support to implement ICT effectively in their arts programmes. This support could be in the form of technical personnel, subject and pedagogical expertise, appropriate hardware and software, along with school infrastructures that enable fast, reliable service. Ideally this would include online sharing of arts expertise and ICT collaborative opportunities to demonstrate and discuss successful practice through a portal such as the Arts Online.

ICT has the potential to enhance real world experiences through collaborative communities of practice. Developments in virtual technologies are creating new and exciting approaches to arts learning and teaching that have never been conceived of before, where real and simulated electronic environments can interact in virtual worlds of practice, and where creativity has the potential to be artistically explored, shared and experienced with others, in the widest possible range of learning contexts and environments.

E-learning allows different spaces and places for creating and sharing arts-making processes with others who are involved in similar endeavours, by providing opportunities to mentor and to be mentored beyond the limitations of the traditional classroom or school setting. By collaborating across what were once barriers of time, available expertise, culture, and place, new perspectives and enhanced cross-cultural communication can be developed.

ICT tools allow new ways to manipulate existing and create new arts practices (such as transdiscipline or intermedia arts), which can then be shared and presented (both processes and products) in online, interactive environments. This *connectivism* (Siemens,

2004) allows for refinement and reflection in and on the creative processes specific to arts practices, and for opportunities to learn new, dynamic ways of thinking and knowing about arts and cultures of the world's peoples for greater understanding and guardianship of the world in which we live.

Background to the Study

The present investigation has been undertaken in conjunction with two other Ministry of Education funded studies:

- *Scoping for Future Provision of Digital Resources to Support the Arts* – searching, reviewing and evaluating digital resources for the arts disciplines of dance, drama, music and visual arts.
- *Professional Development to Enhance Learning in Arts through Effective Use of ICT* - an in-school facilitated development project that supports music and visual arts teachers in a small number of New Zealand primary schools in the re-purposing of selected digital assets and learning objects for enhanced educational outcomes.

These projects have been instigated by the New Zealand Ministry of Education through the Ministry's premise that there is an under-utilisation of digital resources in the education sector. Reporting of the outcomes of these projects is to be finalised by the end of 2006 and will inform further research and development of ICT in arts education.

This literature review aims to investigate the information available relating to the effective use of ICT in arts learning and teaching. In doing so, the following report addresses these overarching questions, as identified by the New Zealand Ministry of Education:

- What does the research tell us about teaching practices using ICT that make a positive difference for learners in the arts?
- What evidence is there of improved outcomes (educational, cultural, social and economic) through the effective use of ICT in arts education?

The purpose of this review is to provide information on studies that identify effective practices in the utilisation of ICT in arts teaching for improved learning in the arts disciplines of dance, drama, music and visual arts. It also considers the findings and makes recommendations for further initiatives to support the use of ICT in arts education.

Over the past decade, in response to similar developments in other countries, New Zealand has developed ICT policies and commissioned evaluative reports on the impact of technologies in schools. The New Zealand Ministry of Education's Arts Strategy and the Digital Horizons: Learning Through ICT strategy, (revised in 2003), have general aims to enable 21st century learners to achieve personal goals; to develop knowledge and skills that prepare them for online learning so that they can be full participants in the global community; and notably to prepare them for potential careers in the Creative Industries of the future by learning in, through and about the arts.

For New Zealand teachers, there is a wealth of readily available digital resources that support arts learning and teaching, in New Zealand contexts and in global contexts, which provide access to the artistic and cultural practices of the world's peoples. These are linked to and shared with teachers on *Arts Online*. Along with online access to a vast and growing range of software, freeware and other online digital materials, New Zealand has a unique range of highly relevant and authentic digital resources available to support this country's arts learning and teaching, notably those that are Māori and Pasifika in content and context. These digital resources are largely housed at the Ministry of Education website Te Kete Ipurangi, TKI (<http://www.tki.org.nz>) in the Learning Communities, Leadspace, Software for Learning and Digistore, which is the gateway to the repository that hosts TLF content. Other New Zealand online sites such as the National Library's *Discover* (<http://discover.natlib.govt.nz/index.shtml>) and Te Papa, The Museum of New Zealand (<http://www.tepapa.govt.nz/Tepapa/>), also contain rich material for arts programmes, supporting uniquely New Zealand cultural identities and links with global creative industries. A search carried out for this literature review revealed that on TKI website, some newly developed examples of good use of ICT in arts practice are available as digital resources online. Music and visual arts have access to a range of

accessible international software and freeware, a number of case studies regarding ICT learning experiences as well as collaborative projects, with some multimedia examples. There is currently little interactive digital material available on TKI to support dance and drama education. Also, in New Zealand, unlike in other countries with similar educational systems (namely Australia and the United Kingdom), there is as yet little evidence of use of collaborative tools and projects to connect community artists with students and teachers, except through the initiative of externally funded trusts, such as the Play it Strange Trust which provides online expert musician mentoring to aspiring contemporary music composers (<http://www.playitstrange.co.nz>). This is not a government initiative but does support music education in New Zealand secondary schools.

In comparing New Zealand with similar education systems in other countries (United Kingdom and Australia) there are opportunities to develop greater synergy and coordination between arts and artists, arts technologies, digital content and ICT knowledge and expertise, so that digital resources that illustrate best arts and educational practices, can be presented online through key portals for all to share. At the time of this literature review, developments have taken place through the Ministry of Education for its website TKI, to rebuild the original platform in order to provide clearer pathways and greater accessibility to collated digital materials and online communities. The Ministry's Arts Online site (<http://arts.unitec.ac.nz>) is also growing its potential to support teachers to access digital resources and communicate online with support personnel, by becoming a key portal for arts education praxis across educational sectors and other relevant community groups. Research discussed in this literature review suggests that by creating these collaborative pathways of access, teachers and students can be empowered to extend their arts and ICT knowledge through online and e-learning opportunities accessible to wide communities of learners. As seen in international examples cited later in this review, these communities of practice can empower and enhance both teaching and learning in arts education within and beyond the classroom and school environment.

The potential of ICT in arts education in the New Zealand context is in its early stages of development and only partially realised. Not surprisingly, there is little research

published about the use and effects of ICT in dance, drama, music, and visual arts in New Zealand contexts. In very recent years, international research is beginning to provide data and analysis on the impact of ICT in teaching and learning in the various and variable arts disciplines, sometimes reported generically as ‘arts’ and often under the term ‘creativity’ (Loveless, 2002). There is growing information about the effectiveness of digital content within other learning areas such as languages, science and mathematics, but considerably less useful information relating to arts education. For example, Freebody’s research from Australia’s learning objects schools’ trials

(<http://www.thelearningfederation.edu.au/tlf2/showMe.asp?nodeID=891>) has informed developments in New Zealand in the utilisation of TLF’s learning objects in schools. However the report does not encompass any reliable statistical data on arts disciplines incorporated under the Australian curriculum area designation Innovation, Enterprise and Creativity, due to limited teacher response to survey questions and limited research focus in relation to this learning area. Generally, international studies do not currently present findings that are specific to the impact of ICT on creative arts practices – both in teaching and in learning. There is a need for such research to be carried out to support and inform New Zealand’s government aims of developing creativity and critical thinking, which are purported by government agencies to be society’s most valuable assets for the future.

Approach to the Literature Review

This literature review involved collecting data from published and online sources, published in the English language, from 1998 to the present day. Attention was given in the first place to New Zealand and Australian literature and then to further research from the United Kingdom and the United States of America where considerably more information was found to be available. The key findings have been presented throughout the report at the end of each section of the review. A full bibliography of the broader literature that informed and underpinned the overall approach and analysis of data is included at the end of this report.

In the initial stage of undertaking this literature review, the research team searched for the documents relating to the use of ICT in the arts in general. This approach brought up

literature concerning, in large part, design and visual arts; therefore, it soon became apparent that more specific search was needed. The research team searched for the literature that relates to the use of ICT in dance, drama, music and visual arts education separately, in order to identify relevant studies. A relatively large number of articles regarding the use of ICT in music education and visual arts education were identified. However, fewer studies were available that relate to the use of ICT in drama education and fewer still on the use of ICT in dance education. The outcome of the search has been the realization that there is a vast amount of sites that offer various types of music software and visual arts software but much fewer for dance and drama, as well as many that are multimedia. Studies and developments in ICT and arts for dance and drama were largely located in tertiary sector sites and the literature for the arts in relation to tertiary education related mainly to online courses.

Having searched and evaluated online materials and library catalogues, the researchers then developed a structure to present the critical aspects of the use of ICT in arts education. These aspects are presented through the remainder of the report under the following sections:

- Arts in Education
- ICT in Education
- ICT in Creative Arts Contexts
- Conclusions
- Recommendations
- Bibliography

Arts in Education

The Arts in the New Zealand Curriculum statement of 2000 identifies four arts disciplines, alphabetically listed as dance, drama, music and the visual arts. Prior to 2000, music and art each had discrete syllabus statements based on decades of internationally comparable praxis, while dance and drama were, to a varying degree, included within the physical education and English curriculum areas respectively. In bringing these four disciplines together under a generic framework, the curriculum statement for the learning area The Arts has been developed in adherence with the New Zealand government of the day's foundation document – The New Zealand Curriculum Framework (1993) – which structured curricula into seven essential learning areas, one being The Arts/ Ngā Toi.

The Arts in the New Zealand Curriculum was founded on postmodernist principles, notably those of multi-literacies. These were articulated within the curriculum strands as enabling students to develop a range of literacies in the arts 'as they develop practical knowledge; develop ideas; communicate and interpret; and understand the arts in context.' In the background paper to the forthcoming Arts Curriculum of 2000, developing literacies in the arts was deemed to both broaden and deepen students' conceptions of the disciplines of the arts, of themselves, and of their worlds. The social, historical, critical and philosophical studies within the disciplines were said to 'inform students of the ways that art works are made, used and valued in past and present societies and cultures.' (The Arts in the New Zealand Curriculum: A Background Paper, 1999)

In a parallel yet separate development during the late 1990s, a Māori medium document was developed in Te Reo Māori for Ngā Toi – The Arts equivalent. It was published in 2000 as *Ngā Toi i roto i Te Marautanga o Aotearoa* - the world's first indigenous people's arts curriculum written for and by the first people of New Zealand, the Māori. It was not a translation of *The Arts in the New Zealand Curriculum* document (2000); rather, it was underpinned by uniquely Māori values, beliefs and cultural practices. The Ngā Toi curriculum statement identified three arts disciplines rather than four as in the

mainstream English language document. The Arts disciplines were articulated as Toi Puoro (Musical/Sound Arts); Ngā Mahi a te Rēhia (Performing Arts); and Toi Ataata (Visual Arts). As in The Arts Curriculum statement (2000), the disciplines were detailed in four generic strands (which loosely translate as Exploring, Making, Knowing, and Appreciating) over eight curriculum levels, yet they differ significantly from The Arts document in many cultural, artistic and interpretive respects.

The British National Foundation for Educational Research (NFER), in 'Curriculum and Progression in the Arts: An International Study,' (Whitby, 2005) presents findings of ongoing research that compares twenty-one countries' arts curricula. New Zealand participated in the research. The survey of content and organization of each country's arts curricula found that:

- Overall, courses for the arts were treated as either separate subjects, e.g. music or visual art, or as larger learning areas covering several subjects, e.g. Arts, Creative Arts (New South Wales, Australia) or as in Scotland, Expressive Arts. Queensland (Australia) includes a fifth arts discipline – media
- All countries had well defined curricula for each of the disciplines of art and music as part of compulsory education
- All countries included a cultural or national context for their arts curricula
- All countries saw the arts as contributing to personal, social and cultural development, as well as purely artistic development.
- Dance and drama were studied in most countries.
- No country included literature within their arts curricula.

In 2006 a new draft curriculum for New Zealand arts education has been developed for consultation in response to an overarching national curriculum review in all learning areas. The new draft arts documentation maintains the four arts disciplines but introduces the Māori concept of Sound Arts- Music as the new music discipline title and embraces this in its achievement objectives and 'essence' statement. Other arts discipline titles

remain unchanged, as do the generic curriculum strand descriptors. The four curriculum strands each detail progression in learning outcomes across eight curriculum levels, with specific and distinct achievement objectives for each discipline as stated in the national arts curriculum document of 2000. Of significance is the inclusion of the use of new technologies in the 2006 draft curriculum, across and within all four arts disciplines.

In defining the arts for the New Zealand Curriculum for the 21st century, the 2006 draft New Zealand Curriculum generic Arts statement (<http://arts.unitec.ac.nz/curriculum/>) summarises arts education: 'Learning in, through, and about the arts stimulates creative action and response by engaging the sense, imagination, thinking and feelings. Arts education explores, challenges, affirms, and celebrates artistic and aesthetic expressions of self, community, culture and our unique environment.' The new draft curriculum also identifies five key competencies that people 'need in order to live, learn, and contribute as active members of their communities. These are: managing self; relating to others; participating and contributing; thinking; and using language, symbols, and texts.' As noted in *Key Competencies and The Arts in the New Zealand Curriculum* (2004) each and every key competency is inherent in arts practices, often expressed simultaneously in arts-making processes. (O'Connor & Dunmill, 2005)

Summary of Findings

Arts Curriculum in New Zealand

- *The Arts in the New Zealand Curriculum* (2000), identifies four arts disciplines - dance, drama, music and visual arts - under the learning area, The Arts. This is a similar structure to other countries' arts curricula
- In 2000, a separate and independent Māori document, *Ngā Toi i roto i Te Marautanga o Aotearoa*, was published. It was written for, and by Māori. The Ngā Toi curriculum statement identified three arts disciplines articulated as Toi Puoro (Music/Sound Arts); Ngā Mahi a te Rēhia (Performing Arts – dance and drama); and Toi Ataata (Visual Arts)
- In 2006 a new draft curriculum for New Zealand is being developed, including arts education, which retains the four arts disciplines and makes more reference to technology but with no specific ICT objectives. The draft curriculum identifies five key competencies that are readily demonstrated in arts practices and collaborations: managing self; relating to others; participating and contributing; thinking; using language, symbols, and texts.

ICT in Education

Information and communication technologies (ICT) is a term used to describe a range of equipment (hardware: personal computers, scanners and digital cameras) and computer programs (software: database programs and multimedia programs), and the telecommunications infrastructures (phones, faxes, modems, video conferencing equipment and web cameras) that allow us to access, retrieve, store, organise, manipulate, present, send material and communicate locally, nationally and globally through digital media. In short, ICT refers to technology which facilitates communication and sharing of information.

It is important to recognise that as computers have become more and more common place, there is a new form of literacy which is required of people: to be ICT literate.

- ICT literacy can be described as *the set of skills and knowledge required by individuals to enable meaningful use of ICT appropriate to their needs.*
- In the context of teaching and learning, ICT literacy can be described as *the ICT conceptual and functional skills to support learners and teachers to further participate in work and society in the future.* (<http://www.rmit.edu.au/>)

The Digital Horizons: Learning Through ICT: A Strategy for Schools, 2002-2004. Ministry of Education, 2003 document, identifies that the challenge for the future is to create a learning culture that keeps pace with the changes and equips people with the relevant knowledge, skills, ideas and values they need to become lifelong learners. The document points out that to meet this challenge the New Zealand education systems must recognise the enhanced breath, richness and authenticity of learning that can be achieved though ICT; the need for people to use ICT and information to fully participate in society and the workplace; and the importance of specialist ICT skills to economic development.

The following definitions are listed in the document:

Digital literacy is the ability to appreciate the potential of ICT to support innovation in industrial, business and creative process. Learners need to gain the confidence, skills, and discrimination to adopt ICT in appropriate ways. Digital literacy is seen as a 'life skill' in the same way as literacy and numeracy.

Information literacy is the ability to locate, evaluate, manipulate, manage, and communicate information from different sources. As learners become increasingly information-literate, they develop skills in discrimination, interpretation, and critical analysis. ICT offers opportunities for higher-order thinking and creativity in processing, constructing, and conveying knowledge.

E-learning is flexible learning using ICT resources, tools, and applications, and focusing on interactions among teachers, learners, and the online environment. E-learning usually refers to structured and managed learning experiences, and may involve the use of the internet, CD-roms, software, other media, and telecommunications.

Online learning is more specific to the context of using the internet and associated web-based applications as the delivery medium for the learning experience.

Another definition inherent in ICT is cited by the National Academy of Engineering, USA: 'Technological literacy, a broad understanding of the human-designed world and our place in it, is an essential quality for all people who live in the increasingly technology-driven 21st century.' (<http://www.nae.edu/nae/techlithome.nsf>) This definition provides the human dimension necessary to the understanding of ICT.

Australasian Government Strategies to Support ICT in Education

In the New Zealand government's digital strategy of 2003

(<http://www.digitalstrategy.govt.nz/>) the vision statement asserts that 'New Zealand will be a world leader at using information and technology to realise our economic, social and cultural goals' (p. 8). The purpose of this long-term strategy is to enable 'all New Zealanders to benefit from the power of information and communications technology (ICT) to harness information for economic and social gain.' In its determination to bring the benefits that ICT can bring to people's lives, the government has implemented a 'wide range of ICT-related initiatives, including the roll-out of e-government, promotion of e-commerce to business, ICT strategies for health, education and national heritage collections, community ICT initiatives, and legislative changes in telecommunications and e-transactions.' Through this integrated framework for existing and future initiatives in ICT, the Digital Strategy is expected to encourage the uptake and effective use of ICT for economic, social and cultural gain.

In Australia's 'Information Strategic Plan 2004 – 2007, Queensland State Government, Department of Education and The Arts', (2004) the position of the arts in ICT developments, both in schools and in the community are seen to be paramount:

The learners in our schools today — Digital Natives — are different from the learners of yesterday. Digital is their native language — a global language in which they are fluent. In contrast, for our education system and most teachers, digital is at best, a second language. How and what we learn is inextricably connected — each affects the other. Most people use old processes with new technology. However, digital languages and tools are being developed outside mainstream education. Chatrooms and SMS messaging are two examples. If we are to keep our students engaged in learning we need to ensure the technology and learning experiences offered in our classrooms keep pace with rising community expectations. Across the arts area of the portfolio, the implementation of Creative Queensland, the state's cultural policy, is helping more people gain

access to and experience the state's wealth of diverse arts and culture. Technology is utilised across the arts from free regional community Internet training and databases through the State Library of Queensland to the unique "hole in the floor" artwork at The Judith Wright Centre of Contemporary Arts that is allowing Queensland audiences to participate in a real-time global exhibition. (Director-General's Introduction, p. 2).

This Queensland State Government strategy outlines four dominant themes for information and knowledge management over the next three years: sustainability, utilisation, investment and transformation. With strong corporate investment in this strategy, the overarching goal is 'to deliver essential information services which ensure a sustainable learning environment.' Performance objectives are to improve ICT utilisation, strategic partnerships and improved management and arts learning outcomes for students. The performance indicators are, in this strategy, documented to be strongly linked to value for money. It can be argued that educational, social, political, cultural and economic capital, are now, more than in any other age of humanity, inextricably connected in the digital age to arts practices – in schools and in the community – for greater cultural capital and economic benefits.

New Zealand School-Based Initiatives

Today in New Zealand, as in the rest of the world, the rapid growth and ever-changing nature of ICT is making enormous impact on people's daily lives. 'Information sources are proliferating. Creativity and critical thinking are emerging as society's most valuable assets'. (Digital Horizons: Learning through ICT, p.6). Schools are increasingly able to access faster, reliable broadband. This provides new methods of teaching and information management that support students and teachers in realising the potential of ICT to enhance learning. To this end, learners (teachers and students) need to develop digital and information literacies so that they might better locate, select and evaluate digital materials through e-learning and online delivery media to support classroom programmes and school activities. ICT professional development programmes in New

Zealand schools have been based on cluster models where selected groups of teachers receive, share, plan, utilise and develop ICT for teaching, learning and administration. The arts are not necessarily the focus of learning in these initiatives but are evident in some ICT learning experiences presented on TKI online resources. Visual arts is represented the most in these learning experiences where there are currently 25 examples online. By contrast, dance is not represented, and music and drama only in a small number. The online Student Gallery includes a project, *New Directions* (2005), containing images of student work generated for a variety of learning programmes. These are displayed alongside notes of the learning context, learning sequence and curriculum strands/objectives. (http://www.tki.org.nz/r/arts/student_gallery/index_e.php)

The Māori arts are also represented on TKI with *Te Ao Kori (Exploring The Worlds of Movement)* (http://www.tki.org.nz/r/hpe/exploring_te_ao_kori/index_e.php) providing activities that integrate health and physical education and Nga Toi (namely dance, music and visual arts in this resource) in rich Māori contexts.

In summary, over the past eight years New Zealand has implemented a range of initiatives to support schools in developing the use of ICT for improved infrastructure and capability, as well as for improved practice and educational outcomes with the view to enhance learning opportunities for all students of all abilities and backgrounds. These initiatives can be viewed on the ICT in Schools pages of the Ministry of Education website (<http://www.minedu.govt.nz>) and on TKI (<http://www.tki.org.nz/e/community/ict/>). New Zealand has adopted an overarching framework for schools that focuses on learning about ICT – exploring what can be done with ICT; learning with ICT – using ICT to supplement normal processes or resources; and learning through ICT – using ICT to support new ways of teaching and learning.

Reported Use of ICT in New Zealand Schools

The New Zealand Education Review Office (ERO) in its evaluation report *The Implementation of Information and Communications Technology (ICT) in New Zealand Schools* (2001), found that in the learning area The Arts, only 57% of schools were using ICT in delivering programmes of learning. Apart from Health and Physical Wellbeing (at 46%), The Arts lagged well behind all other learning areas. In this educational evaluation, arts disciplines were analysed generically and therefore the data does not provide useful information on actual usage by individual arts disciplines. In ERO's *Education Evaluation Reports in Brief* (2005, published in 2006) of e-learning in primary and secondary schools, they found that 'while most schools had developed their vision and direction and had prepared policies and plans for e-learning, development of integrated e-learning and links to the vision and practice were at an early stage'. They also found that primary rural schools' teachers, unlike their secondary colleagues, were doing as well if not better than urban peers in implementing ICT and integrating e-learning. Where schools had been involved with ICT professional development clusters, these schools were more likely than other schools not involved in professional clusters, to have made progress in integrating e-learning. Many schools were said to face problems with hardware and software, identifying the need for significant technical support and reliable telecommunications links. (Education Evaluation Reports in Brief 2005: School Sector, June 2006). Further detailed information about New Zealand government ICT initiatives for schools can be accessed at:

http://www.minedu.govt.nz/index.cfm?layout=document&documentid=7219&data=l#P87_8460

The Ministry of Education's Digital Horizons Strategy (2003) statement that says:

In addition to the fundamental role ICT has in developing learners' digital and information literacy, it also offers powerful opportunities to remove barriers and to provide support in areas of need. For instance, ICT can support online learning in school where certain subject specialities are not available,....and assist students with special needs to achieve their potential.' (p. 7)

The implication of this statement is that ICT can support specialist subject learning that is reportedly required in arts education. There is a wealth of international research that provides clear evidence of the therapeutic capacity of arts, for example music therapy, which assists students with special needs, while the highly technical and artistic practices of the arts extend gifted and talented students. ICT can indeed support students and teachers by, for example, providing video-conferencing of arts tuition to students and professional support for teachers, directly to classrooms or learning centres. This type of initiative is yet to be realised in New Zealand.

New Theories of Learning for the Digital Age

Curriculum change is necessary if the world of the classroom is to keep pace with the world outside. And it is also necessary to have a clearly defined theory which allows teachers to commit themselves intellectually to the change. (Cain, 2004: p. 219)

‘Beyond the Horseless Carriage: Harnessing the potential of ICT in education and training’, by Gerry White (2005), notes that ‘resistance to change prevails in the integration of ICT in the delivery of education and training services within our school, vocational college and university systems and institutions’ (p.1) He advocates a theory of Connectivism developed by George Siemens (2004).

Behaviourism, cognitivism and constructivism are the three broad learning theories most often utilised in the creation of instructional environments. These theories, however, were developed in a time when learning was not impacted through technology. Over the last twenty years, technology has reorganised how we live, how we communicate, and how we learn. Learning needs and theories that describe learning principles and processes, should be reflective of underlying social environments (Siemens, 2004, p.2).

Siemens sees that learning theories now need to move into the digital age in order that educators begin new thinking about learning and consequently better and more effective utilisation of ICT in a connected world.

ICT and Arts Learning

The New Zealand Draft Curriculum document of 2006

(http://www.tki.org.nz/r/nz/curriculum/index_e.php) has a vision statement that describes how education helps students to become confident people who are able to relate well to each other and to be effective users of communication tools (p.4). In this way the concept of connectivity is reinforced across subjects. ICT can also connect learners between classrooms, schools and communities providing wider learning opportunities and multiple pathways to approaching and revisiting new learning in their own time.

Recent international research conducted to investigate the impact of ICT on learning is showing more clearly that students who use ICT in conjunction with their learning have improved achievement scores. *The Impact of Information and Communication Technologies on Pupil Learning and Attainment* (Harrison et. al., 2002) study notes that differences in attainment associated with the greater use of ICT were clearly present in more than a third of all comparisons made between pupils' expected and actual scores. Research suggests that given the right conditions for access and use, significant gains in student learning are recorded with ICT. (Laferrière, Breuleux, & Bracewell, 1999). Clear evidence shows that both the learning environment and curriculum (pedagogy and content) are central to the effective use of ICT. ICT may be used to assist in conveying the curriculum but at the same time may change the content of the curriculum itself. Research has shown that the effectiveness in the use of ICT to support learning lies in its utilisation as a function of the curriculum content and in the appropriate employment of new strategies that are designed to enhance students' learning and teachers' practice. (Cradler & Bridgforth, 1996)

Research also shows us that the use of ICT impacts on both what is known about the world and how we go about learning this information. Current curriculum and models of teaching and learning were not designed to accommodate the increasingly rapidly expanding quantity of knowledge. ICT is rapidly expanding the quantity of knowledge and information and, at the same time, provides tools to more readily access that knowledge. New skills and knowledge are now required in society, schools and workplaces. Students now need flexible approaches to accessing and presenting knowledge using a range of higher-order thinking skills that show conceptual understanding, problem-solving, personal interaction, and the ability to repurpose resources (Riel, 1998). The means to this end often now lies in the effective utilisation of ICT tools designed to support learning. The impact of ICT on the curriculum can therefore be seen to be positive when utilised effectively, no matter the particular area of study. Students are engaged as independent learners who can connect within classrooms now operating as learning communities, and to wider learning communities beyond the school environment.

In arts education, New Zealand-based research *“Like Writing off the Paper”*: *Student Learning in the Arts* (Holland & O’Connor, 2004) reveals many parallels in student learning with that researched in the impact of ICT on learning. The flexible and ‘chaotic’ approaches to problem-solving, the high degree of co-construction (in this case in real-time arts contexts), and the refining and repurposing of ideas and resources are shared by both ICT and arts learning processes

- *Students learn in the arts in an environment of ‘structured chaos’, in which critical reflection and deeper understanding about their lives can occur*
- *The arts provide co-constructed learning environments in which students and teachers have permission to experiment and learn from each other.*

In interactive digital environments students, and their teachers as learners, can connect with innovative online materials to enhance learning opportunities that may have been limited by a lack of teacher or peer motivation and expertise. Co-construction in arts

learning can, through ICT, take place with other learners and mentors beyond the classroom thereby enriching the human and online materials resource pool.

The New Zealand arts learning research also highlights the critical social and cultural, as well as educational, benefits of arts learning.

- *The arts provide pedagogical contexts where more human and negotiated relationships can exist. (p.3)*

Based on overseas examples contained in sites such as BECTA and Futurelab, it is foreseeable that new ICT environments can be developed that provide arts pedagogies and contexts for online communities of practice to share, demonstrate and reflect on arts learning and teaching.

In sum, the student in this digital age is learning “... what people need to learn in order to participate in contemporary social, economic and cultural mainstream life” and increasingly this includes ICT-related practices. (Lankshear & Snyder, 2000, p. 126) These ICT practices are arguably best contextualised in real world creative arts practices – the heart and creative future of social, cultural and economic connectedness.

ICT and Arts Teaching

We must stop looking at the internet as a broadcast, curriculum delivery system that somehow bypasses teachers. There is clearly an exciting opportunity to use new technologies to develop and present high quality teaching resources in the arts. But access to these resources is only a small component of the potential the internet offers. As a two-way communication system allowing pupils and teachers to contribute, connect, share and work with each other. This is not a new idea. But it has not yet been seriously funded or facilitated. (Davies, 2003, p.40).

Overseas research on the impact of ICT on teaching, particularly studies from Australia (Newhouse, 2002) and the UK (Loveless, 2002), have identified the following characteristics of classroom teaching when utilising ICT to support programmes of learning:

- Students may learn outside the teacher's own area of expertise and experience, making management and direction of learning more difficult. This suggests that less teacher directed approaches are better suited to ICT rich classrooms.
- Students on the other hand, may be more highly motivated by the task at hand – a factor that can also create a distraction from the intended learning.
- Teacher tasks that have traditionally been incorporated in learning programmes may become less consequential and too linear for many students as they work more 'chaotically' to discover new learning opportunities.
- Extension work and support for students with greater learning needs can be more easily facilitated.
- Independent learning may not direct itself towards the teacher's objectives.
- Additional coordination of the classroom, students and materials is required. Planning to extend students' thinking becomes paramount.
- Teachers need to continually work at updating their skills and knowledge in the operation and use of ICT.

In evaluations carried out for the New Zealand Ministry of Education on the impact of professional development in the arts on teacher practice (both online and face-to-face initiatives), comparisons can be drawn between arts and ICT teaching.

Where schools have made a collective commitment to the whole school model of professional development within an established learning culture, this model has worked particularly well. It can, however, be compromised by unsupportive teaching staff and/or school leaders, and it has been resource intensive for providers. (An Evaluation of Professional Development to Support the Arts in the New Zealand Curriculum, 2003, Executive Summary)

In the evaluations of arts professional development teachers, particularly in primary schools, were often identifying their own lack of confidence and competence to teach arts disciplines, with students exhibiting more expertise than their teachers. Accessing suitable teaching resources and spaces were also identified in these reports as barriers to implementation. The facilitated professional support provided to those who were able to access it, was deemed to be helpful and motivating.

The 2002 report *An Evaluation of Arts Professional Development Online in Support of the Arts in the New Zealand Curriculum*, noted that respondents to the questionnaire considered that the online initiative had positively influenced their professional learning, mainly in visual arts. Many teachers found that the time-based and performance skills required for the other arts needed face-to-face facilitator support. Around a quarter of telephone interviewed teachers believed that, as a result of the online professional development they received, they could now teach in ways that exposed their students to more challenge in the less familiar disciplines of drama and dance.

In the research on *Student Learning in the Arts* (2004), the arts disciplines were regarded by students and teachers alike 'as qualitatively different from other learning at school. This different quality in arts learning is recognised by teachers as demanding a more flexible, informal approach to teaching than is required or perhaps even possible in

traditional transmission models.’ (Holland & O’Connor, 2004, p.3) This student-centred inquiry-based, ‘chaotic’ approach to teaching and learning has been identified in the literature on ICT teaching. Inquiry approaches to learning are recommended to meet student interests and needs in order that they may have greater opportunities to realise their creative potential and access independent and collaborative pathways to improved achievement.

Barriers to effective utilisation of ICT in teaching are reflected in a number of studies that found that ‘personal access for teachers to a computer for the purpose of preparation and planning is one of the strongest influences on the success of ICT training and subsequent classroom use.’ (Office for Standards in Education, Ofsted, 2002, p.3). Also noted was the need for supportive, enthusiastic and visionary leadership which has a positive impact on teachers’ attitudes and behaviours.

The British research (Harrison et. al., 2002) concluded that students had positive attitudes and good skills due to the ICT curriculum and home use of computers but teachers undervalued the potential by considering it to be “just a tool”. The report concluded that, ‘There is evidence that, taken as a whole, ICT can exert a positive influence on learning, though the amount may vary from subject to subject as well as between key stages, no doubt in part reflecting factors such as the expertise of teaching staff, problems of accessing the best material for each subject at the required level, and the quality of ICT materials that are available.’ (p.45) Similar statements have been cited in the New Zealand evaluations of the confidence and competence of teachers to implement the arts curriculum, noting factors of: teacher expertise; access to physical and human resources; and the selection, quality and application of materials to lessons in each subject at required levels. Use of ICT materials in arts programmes have not yet been researched in New Zealand, however the case studies that are being carried out as a part of the 2006 Ministry of Education, *Professional Development to Enhance Learning in Arts through Effective Use of ICT*, will share both teacher and student perspectives on the processes and outcomes of this intervention.

ICT and Schools of the Future – educational, social, cultural and economic factors

In March 2001, New Zealander Gillian Eadie carried out a study of *The Impact of ICT on Schools: Classroom Design and Delivery*. This study was carried out in schools in Australia, USA, England and Hong Kong in order to inform practice in New Zealand. She summarises her findings by sharing key features of schools of the future that were identified during a panel discussion at an ACEC conference held in Melbourne July 2000. The following shifts in school practice were noted as necessary to make most effective use of ICT in the near future:

- 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 organizations
- “The right connections and the right tools” become more important, emphasising the need for effective technologies
- Interactive, asynchronous discourse becomes an important learning method
- Simulations and virtual field trips become more common
- Schools should recognise the need for authentic learning in online contexts and reconsider how to assess - in new ways with new criteria that suits the context
- 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.

She concludes with the identification of the need for 24 hour access to learning resources, signalling a breakdown of local, regional and international barriers to learning.

Summary of Findings

ICT in Education

- ICT as a term encompasses a range of human-devised hardware, software and telecommunications technologies that facilitate communication and sharing of information across boundaries of time and place
- In order to best utilise ICT, digital and information literacies are required to access and utilise e-learning and online materials, and to appropriately select and operate digital materials and technologies
- Governments worldwide are developing digital strategies to support education in the 21st century
- The focus of these strategies is to enable countries to realise their economic, social and cultural capital; to keep pace with rising expectations and technological advancements; to develop creative, thinking people who can solve problems in new ways and within multi-dimensional learning environments
- Strategic partnerships and improved management of systems and infrastructures are the future focus
- Initiatives to support government strategies for ICT in education are increasing worldwide, and involve community partnerships for enhanced outcomes. In New Zealand and other researched countries there is little data on the impact of ICT in arts praxis
- ICT use in schools is uneven and low in arts classrooms compared with other learning areas in New Zealand research. Barriers include lack of reliable internet access and professional and technical support to embed ICT into programmes of learning, not just as tools, but as planned opportunities to improve engagement and achievement
- New Zealand has developed some online examples of ICT in arts experiences but, to date, without research evidence to support authentic arts learning outcomes and transference of learning into extended arts practices. There is evidence of a growing interest in online teaching and learning to support arts education, for example through the key portal Arts Online

- In overseas studies, ICT has positively impacted on student achievement in core subjects. Some studies are available on the impact of ICT in art and music education but little can be located pertaining to dance and drama in the school curriculum
- Both the learning environment, and curriculum pedagogy and content are central to the effective use of ICT. Teachers need to be confident in their subject knowledge as well as in basic ICT literacies so that they can effectively integrate ICT into arts programmes
- Students are often more engaged and motivated to learn when using relevant ICT to support specific intentional learning. Unintentional learning can also be identified and is often beneficial to wider learning but research has not investigated this in any depth, and not in any arts education contexts
- New learning theories are needed to move educators into the digital age. Siemens' (2004) Connectivism is espoused as an effective conceptual model
- New pedagogies are needed by teachers to cater for the dynamic and chaotic learning that can take place as students steer their own learning in areas of need and interest through the use of ICT. Arts learning and teaching environments are reportedly dynamic and chaotic and so are well placed for closer integration with ICT environments
- Teachers need to plan for the integration of ICT into teaching and learning programmes to cater for individual students and to select quality digital material
- Teachers need professional support to integrate ICT into programmes of learning in the arts through technical, practical, pedagogical, infrastructure, and school management assistance
- Communities of practice are opening new learning pathways, collaborative opportunities, and wider access to information and expertise beyond the traditional teacher-student, school-based systems, which can assist specialist subjects such as the arts disciplines
- ICT can allow ongoing creative learning opportunities across time, culture and place.

ICT in Creative Arts Contexts

Enhanced Creativity through Connectivity

The arts give expression to people's personal, imaginative ideas and responses to the environments in which they live. This creativity is born out of feeling and realised in the manipulation and structuring of a range of distinct skills and knowledge bases. In the arts, where the reliance on written text is less than in other learning areas, multi-literacies are developed. These audio, visual, and kinaesthetic symbolic literacies involve higher thinking and dynamic non-linear applications of skills and knowledge. The knowledge developed in each arts discipline becomes a network of concepts with many connective pathways. Digital and information literacies are reliant on these same principles of learning yet the arts provide the contexts for imaginative thinking and creative practices that give aesthetic realisation and socio-cultural expression to individuals and groups of people – in the past, the present, and in the future.

To this end, teachers of the arts need knowledge and skills in the disciplines themselves and in pedagogies best suited for high quality arts praxis. They need to know what and how to teach in order for students to achieve and progress in their learning. However, arts education in today's world also needs to embrace new technologies and pedagogies that suit active, exploratory, inquiry-based learning to stimulate creativity and critical thinking – key features of arts practices – in rich, connective contexts. Such diverse and motivating approaches to learning can be supported by accessing and selecting appropriate digital resources that enable learners to collaborate, interact and connect with other learners in an online environment.

Societies of the 21st century require active participation in the fast-changing 'Knowledge Age' in which there is an interaction between people, communities, creative processes, knowledge domains and wider social contexts. (Loveless, 2002, p.2)

As noted earlier in this report, Siemens' (2004) connectivist theory is based on the principle that learning is chaotic rather than linear and sequential. Arts learning can be seen to be non-linear and chaotic in the processes of learning. In the research undertaken into learning in New Zealand arts classrooms, "*Like writing off the Paper:*" *Student Learning in the Arts*, Holland and O'Connor (2004) describe arts classrooms as 'structured chaos'. Two ideas are implied in this term. Students manage a process whereby they structure and form artistic work from chaotic creative energy. Secondly, that students use arts processes to structure the chaos and disorder of their own lives. The arts become a tool for ordering and structuring, making sense of chaos and they also require self-managing competencies to achieve satisfying artistic work. The research indicates students move in a non-linear, seemingly chaotic fashion but with underlying structure to generate new work, to apply their new knowledge to new situations, to reflect on and refine their work and to ultimately transform their understanding. Students learn patterns of management as they strive to complete an artistic work, using artistic skills and specific competencies to achieve this in partnership with key self-management competencies. These competencies are compatible with and transferable to the contexts for learning provided in the use of ICT to enrich arts learning.

Loveless (2002) argues that learners and teachers 'can use ICT to support imaginative expression, autonomy and collaboration, fashioning and making, pursuing purpose, being original and judging value'. She goes on to say that ICT can offer opportunities to be creative in authentic contexts in ways which have not been as accessible or immediate without new technologies. 'Such accessibility and flexibility, however, present challenges to teachers and schools in confronting present models of resources, timetables, curriculum and assessment requirements, which can inhibit learners' engagement with creative processes and lead to a superficial or fragmented focus on products. Creativity can be promoted and extended with the use of new technologies where there is understanding of, and opportunities for, the variety of creative processes in which learners can engage.' (Loveless, 2002, p.2)

Arts learning and teaching are strategically placed to harness the rich digital opportunities that support new and developing creative and critical thinking, using both ICT and arts skills and knowledge to enhance learning and understanding in the world of arts practices. It is not only in classroom settings therefore that arts learning can be more fully explored through ICT. Community artists and digital resources that support arts learning are as accessible in an online world as the increasingly sophisticated and motivating software and freeware. Never before have “experts” been so available to learners through online communication and supported e-learning opportunities. Such partnerships are to-date relatively undeveloped in New Zealand, particularly in relation to arts in education and society.

By comparison, since 2000, the British Government has responded to the debates about creative and cultural education to meet the economic, technological and social challenges of the 21st century with a range of projects and initiatives to enhance learners’ experiences of the creative arts. ‘The potential of digital technologies to enable such new forms of engagement, access and educational achievement has been recognised in the UK’ in the development of a range of agency partnerships. Many BBC education initiatives have been funded by the UK government to support teachers and supply digital content for schools (Blackstone, 2002). *The National Foundation for Educational Research* (NFER) in England and Wales carried out a thematic review on behalf of the Qualifications and Curriculum Authority (QCA), focusing on information from 19 educational systems to provide a comparative analysis of the arts, creativity and cultural education. The potential of new technology to provide resources for arts education was recognised in many countries ...’ (Loveless, 2002, p.3)

In 2003 two important literature reviews were commissioned by the British Educational Communications and Technology Agency (Becta), to evaluate learning and teaching in the UK, across the curriculum, using ICT. These were published in 2004. In the review *ICT and Attainment: A Review of the Research Literature* by Margaret Cox, et al. (2003), evidence showed positive effects of specific uses of ICT on students' achievement in almost all National Curriculum subjects, with the most substantial evidence of these

effects in English, mathematics and science where nearly all of the research had been carried out. There was an identified strong relationship between attainment and the ways in which ICT is used; 'where specific use of ICT is closely linked to learning objectives, there is a positive effect on pupils' learning.' The arts, per se, were not reported on in any of the studies. 'Comparatively little research has been published about the effects of ICT in arts, music, business studies and physical education. Some studies provide evidence of the enhancement of pupils' learning through specific ICT applications such as music synthesizers in music, digital imagery software in art'. (Cox, et al, 2003, p.4-5)

In the Becta review *ICT and Pedagogy: A Review of the Research Literature* by Margaret Cox, et al. (2003), the study considered teachers' uses of ICT, and the impact on students' achievement, being influenced by teachers' pedagogical reasoning. It was ascertained that when teachers use their knowledge of both the subject and the way pupils understand the subject, their use of ICT has a more direct effect on students' achievement. There are research studies reported in the Becta review about the effects of ICT on the teaching of art, physical education and religious education, but they are very few and provide little new evidence about the effects of ICT use on teachers' pedagogies in arts education. There is a need for more research in these areas, especially because of the specialised nature of art and music teaching. Dance and drama were not specified in any studies.

The New Zealand Education Review Office (ERO) findings in the use of ICT in the arts were rated at 57%, well below most other curriculum areas (ERO, 2001). This is likely to be an overstatement in that no discipline-specific statistics were gathered so the figure is not useful in determining actual teacher and student usage of ICT in relation to each arts discipline. At the time, there were no government-funded initiatives in place to support ICT and arts implementation. As a result, there is an absence of research on the impact of ICT on arts education praxis.

In the UK Office for Standards in Education (Ofsted) report *ICT in Schools: Effect of Government Initiatives, Implementation in Primary Schools and Effect on Literacy* (Ofsted, 2002) identifies ICT and arts through the curriculum areas of art and design, and

music. Dance and drama are not reported as curriculum subjects in the UK reports as they are subsumed within physical education and English respectively. Despite initiatives to support ICT in schools, arts subjects were not targeted for support and there is evidence of poor and declining use of ICT in art and design classrooms. ‘There is little evidence that the teachers of the subject are engaged with the creative process in their uses of ICT.’ (Davies, et al, 2003, p.7)

Progress in the use of ICT in art and design is uneven, with the occasional pocket of exemplary practice, which is sometimes little known outside the school or the department.’ (Davies, et al, 2003, page 6)

The question for UK art and design teachers, as well as for New Zealand arts teachers in general, is now one of how to support the use of technologies to extend the creative work inherent in arts teaching and learning. Improved access to arts and media organizations and creative practitioners such as artists, musicians, dancers, actors, designers and technologists is the key to greater synergy and connectivity to critical communities of practice, linking the school to the world of creative industries. The analysis of teachers’ responses and researchers’ observations in the UK studies reveals that ‘effective integration of ICT, in art and design in particular, is typically based on ideas (both teachers’ and pupils’) that provide substance and drives new projects and approaches. The technology facilitates this process but is rarely the central focus of the project. ... It seems to be the integration or joining-up of creative connections that is central to developing ICT in art and design. In addition, it is only when the art department is valued as a unique but integral part of a whole school ICT policy that this can truly be effected.’ (Davies, et al, 2003, p.40)

In the UK, music technology has for some time been recognised as a valuable learning area, supporting music curriculum and student learning.

ICT has had a positive impact on teaching and learning in music in the majority of secondary schools. Music technology is often used successfully to enhance the

development of a wide range of musical skills, as well as being an area of study in its own right. (Ofsted, 2004, p4)

Music education has undergone dramatic changes in New Zealand also. It is commonplace for secondary schools in particular to have music suites that are fully equipped with both hardware and software that allow students to compose, perform, arrange, develop aural and theoretical skills, and to research music. The utilization of these technologies by students and their teachers has required new approaches to learning and teaching in order to enhance outcomes and stimulate new thinking. Students and teachers now engage with and organize sounds in new ways, challenging the very nature of music itself at the most fundamental levels. No longer are theoretical studies that are divorced from practice viewed as pedagogically appropriate. Inquiry-based, exploratory practices that follow seemingly chaotic approaches can lead to new understanding about compositional and performance processes to create new sound works of art. It is the world of possibilities now available in sound and image that is changing artistic practices in music education through effective use of ICT.

Australia's New South Wales Department of Education and Training site

<http://www.curriculumsupport.education.nsw.gov.au/secondary/creativearts/>

is a model that New Zealand could consider developing as a key portal for ICT and arts education. Here the arts are entitled 'Creative Arts' with the individual disciplines of dance, drama, music, and visual arts each having its own specific ICT area with examples of best school-based practice. Professional learning for teachers, student tutorials, software recommendations, annotated units of work, workshops and community links all support improved outcomes for teachers and students in arts learning through the use of technology. There are specific ICT curriculum objectives to be met for the arts, while at secondary levels opportunities to achieve across the curriculum (notably in technology) are offered.

In sum, partnerships between the arts and interactive technologies are essential to the future of quality arts educational praxis and improved arts outcomes. The arts have

always offered another way of seeing and knowing – ourselves, and the world we live in – and this alternative view often challenges prevailing world views. The arts offer new and imagined possibilities, different pathways and non-linear processes that enhance learning and provide learning in the creative, higher-order thinking processes much needed in the world of today and more importantly for the future. ‘Partnerships between the arts and interactive computer technologies are necessary... if we wish to see technology develop from assumptions about what counts and what has value other than the travelling consumeristic worldview.’ (Gigliotti, 1998, p.92) Curriculum objectives for arts need to articulate ICT specific requirements for today’s students to access and achieve rich arts learning opportunities that best engage with and further develop new media. In this way assessment of improved outcomes based on ICT in arts praxis may be monitored and evaluated. As educational tools, ICTs are as good as how they are used. It is now the value-added focus of ICT in arts praxis that needs to be researched.

New Zealand Examples of Online Arts Resources

Te Kete Ipurangi (TKI), the New Zealand Ministry of Education website, has some examples of teachers’ ICT projects that have utilised ICT in arts contexts. These can be viewed at <http://www.tki.org.nz/e/community/ict/>. For example, *Cameraless Animation* is a unit of work describing the creative processes carried out by students at Glen Eden Intermediate. These students were taught to use the software Paint, Microsoft GIF Animator, Hammerhead Rhythm Station, and Frontpage to create animations which combine colour, shape, movement, and music. This work was developed as part of the school’s ICT Professional Development Clusters Project work. Other digital materials on TKI include: digital music compositions and snapshots of learning using music and visual art software; *Pasifika* arts activities that explore dance, craft and music using ICT; digital stories and research papers written by teachers including e-fellows (a Ministry of Education award scheme for ICT-motivated teachers) and the Student Gallery where students are able to showcase their own movies, pictures, music, animations and presentations as digital media.

Two of the e-fellows of 2005 carried out projects on ICT and music. Lyn Dashper, music specialist teacher at Northcross Intermediate School in Browns Bay, Auckland, researched the factors that lead to engagement of Māori children in their learning. The investigation considered whether using Taonga Puoro (traditional Māori musical instruments) as a cultural artefact, in both hands-on and online environments, would foster engagement in Māori students and the results were very positive.

Another e-fellow project by Mark Edwards, Rutherford Primary School, located on Te Atatu Peninsula, researched ways to make music learning exciting by using digital technologies, such as Garageband, to generate enthusiasm in students towards learning music.

Both of these projects showed strong evidence of improved motivation, engagement and educational outcomes, in the widest sense, through the effective use of ICT in music education. Specific music technology skills were developed and creative opportunities to develop higher order thinking enhanced music learning outcomes.

Currently there are very few online resources on TKI in dance and drama that share student work that utilises ICT in those disciplines. One e-fellow for 2006, Carol Marks from Selwyn Kindergarten, is currently undertaking a project entitled *Imagined Possible Selves*. The purpose of this project is to use ICT activities to evaluate their impact on the learning through imaginary play. Other online resources include *Dare to Dance*, which is an integrated series of activities that fit within the New Zealand curriculum with activities that involve viewing, performing, comparing, and contrasting dance using ICT. *It's Show Time* has a similar activity approach with a drama focus.

On the Arts Online site (intended for teachers) there is an example of an ICT and dance project, in which the teacher and primary students created an iMovie that illustrates the movements and shapes that the students learned in their dance unit. On this site there are a number of examples of units using music technology and a large number of music site reviews including software and freeware for classroom use, while visual arts site links

include, for example, virtual tours through national and international galleries. Again, dance and drama online materials are growing, but are fewer in number and depth to those in music and visual arts due to their relative newness as arts subjects within an arts curriculum.

There are many online teacher resources in all arts disciplines available on TKI but as yet, the only interactivity for arts praxis is through Arts Online listservs and this site's Interactive Unit Planner. All online materials on the Arts Online site are selected by arts experts to support teacher planning and professional practice. The site actively promotes the sharing of ideas and resources online, with the ultimate aim of enhancing student learning in the arts in New Zealand.

The Le@rning Federation's Innovation, Enterprise and Creativity online curriculum content 'is designed to produce rich interactive multimedia learning resources and tools that enable students in years 1 - 11 to engage in compelling learning experiences that enhance their capacities and skills to be innovative, creative and entrepreneurial. The digital resources support the arts and technology curriculum and also explore opportunity, entrepreneurship and vocational learning. The general educational intent, however, is that these learning objects can be used as transdisciplinary resources. Students are compelled to explore, take risks, analyse and synthesise information, think critically, solve problems and make decisions.'

<http://www.thelearningfederation.edu.au/tlf2/showMe.asp?md=p&nodeID=2.>)

The Federation's Arts, Design and Technology

<http://www.thelearningfederation.edu.au/tlf2/showMe.asp?nodeID=1102>)

set of learning objects focuses on creative skills, and critical and aesthetic appreciation of artistic techniques and technologies in media, music and visual arts. In the three series of 3D rendered sonic learning objects, students explore and manipulate sounds, video and images to create their own music/sound compositions. Exploration, analysis and synthesis of this process are encouraged to develop an understanding of the different purposes of the creative arts in real-life contexts (enterprise). *Sonic space*, *Sonic time* and *Sonic*

motion scaffold learning through progressive activities that include self and peer reflection on the artistic processes.

These learning objects, co-designed in Australia and New Zealand, are accessible via the Digistore community, based on TKI. Although at this stage there are few TLF arts-based learning objects available, the three music/sound arts objects - Sonic space, Sonic time and Sonic motion - are grounded in music curriculum content and pedagogy. At the time of writing of this report, more visual arts-based objects have been under development. Little trialing of the available arts and technology learning objects has occurred in New Zealand at this stage. The Ministry of Education's concurrent projects aligned to this review aim to trial and report on teacher and student utilisation of these objects and other digital resources within wider case studies of engagement with ICT in arts learning and teaching programmes.

On the internet we are able to access New Zealand and worldwide galleries and museums, to view and research artists' works. Through email or video-conferencing we can network with artists and interested communities to share ideas, and pose questions.

International Examples of Interactive Digital Projects

The following examples of reportedly effective use of ICT in arts teaching and learning demonstrate the enhanced opportunities to learn in multi-dimensional, socially interactive, connected creative endeavours.

- *The Crucible Project* (<http://www.curriculumunits.com/crucible/main3.htm>), an example of ICT in drama (developed by high school English teachers in Massachusetts in 1998) provided students with examples of online art, history and media that could be related to Arthur Miller's play 'The Crucible'. Students were able to connect with people and places normally out of reach to expand their learning experience. They were able, for example, to link from *The Crucible Project* website, (developed by the teachers and students), to an interactive program found on the National Geographic website where

they could experience what it would be like to be accused of witchcraft in 1692 Salem. Virtual tours and webquests supported the learning with the ICT opportunities supporting individual learning needs and interests of students beyond what the traditional classroom programme would have been able to offer.

- At the 'CAL99' Conference (London, 1999) two teachers from Ikeda Junior High School in Japan (Head of Music and Head of English) presented the benefits to the students of working with partners from another culture. The exchange of practical teaching ideas through the collaborative work on the project was a highlight, notably in sharing ideas in music, art, dance, drama, the nature of Kabuki Theatre, and curriculum management. Teachers in two sister schools in Japan and in England constantly worked together to devise new programmes of work for their students which resulted in the Japanese school introducing drama lessons into the curriculum in Japan for the first time. Students who participated in the project linked across nations to explore the use of new technologies. They also helped with the planning and development of many aspects of the project. Drama, dance, music, science and textiles work formed the material for the video-conference discussions and email was used for day-to-day communication. The creative use of video conferencing was the key technology tool that facilitated communication between the two countries. These collaborations in the *Kabuki Project* have led to both countries seeking new ways to collaborate using the new technologies, which participants said were changing social values in the two countries and creating exciting new opportunities for education. 'Teachers now have the tools they need to help them create a better future for their pupils. World peace is no longer a ridiculous aim, but one which we might work towards achieving the creative use of Information, Communication and *Friendship Technology*'. (Williams, 2001, p.59)

- There are a growing number of successful arts projects that feature video-conferencing as the main ICT tool. *The Hands-On Dance Project* (www.satorimedia.com/hands_on/project2.htm), a research venture based at the University of Leeds, enabled interactive dance workshops between novice and more experienced dancers to take place using e-mail discussion, internet video conference

rehearsals and an interactive website. Online and interactive mentoring of specific skills in dance, from expert to novice with opportunities for ongoing and wider artistic collaborations that would be otherwise inaccessible, are key to enhanced learning, and arguably to improved teaching pedagogies.

- On ED.gov, the US Department of Education site designed to ‘improve student performance’ there are exciting developments in collaborative, interactive digital projects that utilize ICT in arts-based, culturally rich contexts. *The First People’s Project* <http://www.learn.org.au/fp> is an ongoing collaboration among indigenous students aged 6 – 18, from countries all around the world. They exchange ideas, culture and art. Students produce art work and writing on selected themes which change from year to year. In 2005 – 2006 the theme for exchange is *My Community Past and Present*.

Kids’ Space, <http://www.kids-space.org>, is another collaborative project on ED.gov site. This gallery was launched in 1995 with the first participants from the U.S., U.K., Canada, Australia, and Hong Kong, and now attracts participants from over 150 countries. Students submit original art work to share with other classrooms. The art work is digitized by the students (flatbed scanner, digital camera, or original digital artwork) for presentation online.

A third project on ED.gov is *Global Arts Project: Art Miles*: <http://www.the-art-miles-mural-project.org>. ‘Students, schools, organizations, after school program participants, design and create murals that are grommeted and seamed together with murals created by children from all over the world. There are twelve themes involved in the project; The Multicultural/Diversity Mile, The Environmental Mile, and The Indigenous People’s Mile, Sports Mile, Women’s Mile, Fairy Tale Mile, Hollywood Mile, Music Mile, Senior Mile, Peace, Unity and Healing Mile, Mentor’s Mile. Children work together to decide on what theme they want to work on. It is important to let them know that this mural will go on tour in museums and their work will be seen in many countries, on websites, on TV, and in the future in publications and magazines. Ultimately, the idea of their names being included in the Guinness Book is a big thrill for them.’

- In support of cultural heritage and growing understanding of artistic and cultural practices over time, the UK *Culture Online* (<http://www.cultureonline.gov.uk/>) provides a service offering interactive access to national arts and cultural resources through the internet and digital television. This BBC initiative is government funded and is a partnership with national agencies and key cultural portals.

- There are a range of technologies available for producing and manipulating quality sound and lighting effects. Creative set design software and virtual theatres where students can write, perform, refine, record their own ‘productions’ are now available and increasingly being utilised in dance and drama courses, largely in the tertiary sector. Interactive spaces for dance, theatre and circus provide new artistic and expressive communication in these art forms, as real and imaginary worlds of moving images, graphics and text work together with human beings to communicate meaning. For example, in 2000 IBM launched its ‘*Media actors*’ software architecture that can be used with real-time computer-vision-based body tracking and gesture recognition techniques to choreograph digital media together with human performers. These interactive technologies can enhance traditional performances and allow audiences to engage with virtual characters in interactive environments. This is the digital arts media for schools of the future.

- The United Kingdom has many enlightened digital developments to support music learning. Futurelab, a not-for-profit UK organization, tells us on its website at http://www.futurelab.org.uk/about_us/index.htm, that by ‘tapping into the huge potential offered by digital and other technologies, we are developing innovative learning resources and practices that support new approaches to education for the 21st century.’ Futurelab works in partnership with industry, policy and practice and is developing many exciting innovations for music and arts education. Examples of innovations taking place for music in and beyond school show the high degree of future thinking and community partnerships that are possible. These rapidly developing technologies include new musical networks and interfaces, particularly those that utilise GPS (Global Positioning Systems), haptic and tangible interfaces (virtual technologies), and mobile telephony.

Examples of new musical interfaces from the London-based media group *Some;ing*, open source music solutions by *Fervent*, the potential of *Active Posters* from HP Labs, and Futurelab's audio-visual project *Jungulator*, provide snapshot evidence of the future which is envisioned as interactive soundscapes where anyone can create music anywhere and at any time, as they musically sculpt and shape their environment.

Acknowledgement of the 'power' of music to 'socially engage hard-to-reach young people and its benefits in providing a shared space for cultural understanding, along with the importance of facilitating young people's musical skills and knowledge', as stated on the Futurelab website, form the foundation principles behind such developments. A next step for experts in both formal and non-formal education settings in utilising new technologies is to further people's general understandings and appreciation of professional musicians' skills, while simultaneously providing scaffolding opportunities for talented young musicians. In this way learning journeys can lead learners to career pathways through rich, authentic practices that are shared with others in online communities for enhanced cultural and possible economic benefit.

Augmenting these experiences, new, 3D, virtual technologies provide learners with forensic-like insight into the nuances of professional musicians' skills and their relationship with their instruments. Such experiences allow for a greater understanding of the sensitive, expressive skills required by professional musicians. On the street, hand-held musical interfaces now allow for everyday events to be sampled, shared and distributed across networks, while tangible and tactile interfaces ensure that music is accessible to for all ages and abilities. With the development of more complex interfaces, experienced musicians could be provided with new avenues of exploration and play.....What these visionary developments capture is a world where our musical identities are extended, negotiated and re-constructed via mobile and personal devices, in on and offline environments. Such scenarios empower us to co-create our own musical compositions, publicly share them and engage in new musical ways with our surroundings. This world requires technical skills, confidence in moving between real and virtual worlds and

knowledge of working across networks. It also requires large, accessible databases, secure yet flexible networks and importantly a new vision for how and where we learn and the tools, materials and resources necessary for this happen. This world is slowly being built. (Future Music Insight Paper, Futurelab, 2005)

- *Interconnected Musical Networks* (IMNs) are computer systems that allow players to independently share and shape each others' music in real-time. Developments such as *Hyperinstruments* have created new musical instruments such as *Beatbugs* - palm-sized, hand-held, digital musical instruments that were initially designed to provide a formal introduction to mathematical concepts in music through an expressive and rhythmic group experience. 'Multiple Beatbug players can form an interconnected musical network - The Beatbug Network². By synchronising with each other, users can trade sounds and control each other's music. When connected, the Beatbugs have been found to encourage collaborative creativity and composition and social play.' (Futurelab, 2005) Using such technologies has enabled large-scale, international projects to develop. These demonstrate how artificial intelligence, haptic and interactive interfaces can be used to facilitate collaborative musical interactions between professional musicians, young learners and the general public within arts, community and orchestral spaces (e.g. projects such as *The Brain Opera*⁴ (1996-2000) and *Toy Symphony*⁵ (2000-2003)). Such technologies may also be effective for dance education and allow collaborative interactions between performing artists in the community. (Futurelab, 2005)

- Sonic arts are a widespread development in music education in the United Kingdom. *Using ICT to enhance Pupils' Learning: A Case Study of Good Practice in Schools*, by Eileen Davies, (www.embc.org.uk/_docs/SONIC.pdf), is an example of sonic arts project. This ongoing government-funded digital project sees students across year levels engage in a national education programme entitled "Sonic Postcards", which uses the environment as the inspiration for creative arts and ICT activities. Run by national sound and technology organisation, "Sonic Arts Network", the project aims to explore and compare the local sound environments of young people right across the United Kingdom. Students use digital music technology on computers and digital video. They then became

sound and image designers themselves - making their own sonic postcards using computer software. 'The project encouraged the school to exchange the completed postcards with other schools via broadband internet connections, gaining a unique insight into their own environments and sharing a range of environments with other schools - from the urban inner city to the rural countryside, opening windows on new places, other lives, and different cultures. Sonic Postcards links a number of curriculum studies at Key Stages 2 and 3, including music, geography and ICT, as well as English, citizenship and art and is pertinent to key government initiatives for e-learning and for the environment'. (Davies, 2003: p. 1)

- Teachers of art and design in the UK and Australia, as in New Zealand, use ICT in a range of ways: as a creative medium – often in combination with other, more traditional, media; a research tool; and, especially on examination courses, as a means of producing written coursework, sometimes involving the amalgamation of images and text. Where departments have interactive whiteboards and presentational software, teachers are able to use ICT to introduce modules of work, explain digital or other, more traditional, art processes, or connect the class to materials relating to a particular artist or genre. Presentational software is also used by pupils to share research findings. Software such as Photoshop is popular in student tutorials on the New South Wales Education and Training visual art site at

<http://www.curriculumsupport.education.nsw.gov.au/secondary/creativearts/ict/visualarts/index.htm>. 'Floating ball explores basic PHOTOSHOP techniques of selecting, layering, transforming and filters to create an image of a pool ball floating over a body of water. Students can use these skills as a departure point for developing their own ideas based on objects in a landscape, landscape environments and experimenting with reflections.'

- The *Dare to Imagine* site (<http://www.valleyandvale.co.uk/>) is a Welsh community arts site with a mission statement "changing lives using arts and media to release potential." 'Artes Mundi, Wales International Visual Art Prize, worked in partnership with Valley and Valley Community Arts and Betws Primary School in June 2006 on this large-scale

creative children's project. *Artes Mundi* is a major biennial event within the visual arts, celebrating today's artists from across the world and offering the opportunity for individuals, groups and communities to engage with contemporary art and work alongside professional artists to explore their own creativity and culture.'

- Commercial sites proliferate the web and most are interactive, and often arts-based. *MaMaMedia* (<http://www.mamamedia.com>) for example, fosters creativity and enables children to explore the web. One activity, 'Surprise', enables children to develop their own digital stories, build multimedia towns, and create digital drawings complete with audio and animation. Another more drama-based industry site Columbia TriStar's *Dawson's Creek* (<http://www.dawsonscreek.com>) enables young people to interact with the main character, find out his innermost thoughts and feelings, providing insight 'into the future of interactive television, especially in the way that program content is expanded and integrated into interactive Web site features.'

Research into the impact of ICT in arts projects is clearly needed, particularly in New Zealand where such research has not yet been a focus of educational evaluation. Loveless (2002) researched the work undertaken in UK primary schools where students worked with visual artists using media including digital technologies (scanners, cameras and graphics software) to capture and manipulate images in order to create and make meanings in the visual arts. Students shared and evaluated each other's work in progress. The learning was rich in both ICT skills and in arts techniques and knowledge bases. Projects that were researched revealed an enhanced desire by the students to explore and produce specific effects. The aims of the projects were clearly met in that the focus was on the creative process and expression of artistic meanings. 'The investigation of children's use of multimedia and presentation tools to create multimodal texts with images, written text and sound also recognises the development of multiliteracies in work across the curriculum ...The educational benefits are clear in terms of the impact on student learning of the effective examples of ICT and arts projects researched by Loveless for the UK government. The research evidence showed that students engaged in these projects were able to work creatively, use higher-order thinking, utilise

multimodality, develop multiliteracies, and transform and make artistic meaning from digital data. The creative processes of imagination, fashioning and ‘flow’ were supported by the immediacy of the presentation, the ease of manipulation and development of ideas, or revisit them in order to explore other possible routes.’ (Loveless, 2002, pg.11)

Along with the educational benefits cited through this report, there may be potential for social, cultural and potential economic benefits to be derived from effective ICT and arts learning experiences particularly where interactive, connective practices are used. Such potentially beneficial developments can be seen in successful overseas projects such as *The Hands-On Dance Project* (www.satorimedia.com/hands_on/project2.htm) where community artists collaborate with schools on projects to produce quality arts works.

It can be argued that as learners use ICT in arts learning, they develop the key competencies outlined in the New Zealand draft curriculum of 2006, for example, based on the research presented in *Key Competencies and The Arts* (O’Connor and Dunmill, 2004), the effective use of ICT can further support these assumptions: students using ICT in arts must:

- manage themselves as they learn to use technologies and time-manage explorations;
- employ multiliteracies that develop their creative potential through imaginative and structured thinking;
- learn to relate to others in new ways in online environments as they find different means of communicating and knowing the people of the world;
- participate and contribute in multidimensional ways as they share ideas, develop arts works, discover and share cultural perspectives, and present their creative ideas online using multimedia tools.

The rapidly developing digital landscapes and learning environments, hopefully have the potential to provide our future generations with the abilities, skills, knowledge and human

understanding to enable them to become thoughtful, active, artistically creative citizens who engage with ICT in arts rich contexts.

Summary of Findings

ICT in Creative Arts Contexts

- Creative arts practices can be promoted, extended, shared and presented with the use of new ICT
- Community partnerships are proving to be very successful in international examples where mentors and community artists collaborate with schools in online environments
- Integration of the arts and interactive technologies are essential to the future of quality arts educational praxis and improved arts learning for students in the 21st century
- New Zealand has a growing range of digital assets, and online resources for arts teachers, with developing interactive sites for students and teachers designed to support collaborations across New Zealand
- Learning Objects are beginning to be used and developed in New Zealand following trials in Australia through The Le@rning Federation studies, but are few in number for the arts
- Overseas initiatives show exciting developments in arts-based projects that effectively integrate a range of sophisticated, multi-dimensional technological tools. Projects that connect students across places and cultures are particularly powerful in supporting indigenous groups affirm their identity in the global community
- Social, cultural and educational engagement between communities of practice are exemplified in online and e-learning projects where video-conferencing is playing a key role in mentoring in the arts (for teachers and for students) in other countries
- 3D virtual technologies have the capability to change arts practices through transdiscipline, multidimensional, creative interactivity in both real-time and imagined worlds
- Careful consideration needs to be given to selection and planned utilisation of quality digital materials for improved student outcomes in relation to curriculum objectives and student learning goals.

Conclusions

Research on the impact of ICT in arts education is a new field of study and there is currently little information available that directly considers this in depth. Studies have been carried out, particularly in the United Kingdom, on ICT in the National Curriculum but art and design, and music (as independent curriculum subjects) still receive little acknowledgement. Internationally, research is growing in finding evidence of the benefits of creativity and ICT, while government ICT mission statements cite the role of creative thinking in economic, social and cultural goals of their countries. It is interesting, therefore, that so few studies and funded initiatives are in place for the arts when arts, as the cultural and social creative expression of humanity, are pivotal to ICT developments notably in virtual technologies and collaborative digital projects that connect people world-wide.

International education websites make specific links and feature examples of best classroom practice in ICT in arts contexts. For example the New South Wales Department of Education and Training site has included an area on ICT specifically for each arts discipline to support teachers and students in enhancing achievement in the arts by meeting specific curriculum requirements in technology in the arts. Teacher professional learning, student tutorials, databases of software, case studies in ICT in the disciplines, and cross curricula links feature on this site. New Zealand has yet to develop similar ICT in arts sites within a key educational portal so that student learning and teacher practice can be enhanced and be brought up-to-date with international initiatives. Links to community artists and e-learning opportunities in the arts, as identified in the United States, the United Kingdom, and increasingly in Australia are yet to be developed in New Zealand. The economic, social, cultural and educational benefits of such developments should be researched to inform initiatives to support this important area of arts and technology development for creative thinking students of the 21st century.

Today's world is one of rapidly expanding information and communication technologies (ICT). Young people, as so-called 'digital natives', are fast becoming literate in multiple new and dynamic ways, challenging the very notion of literacy as has been traditionally espoused for the past two centuries. Information that empowers learning is now available on the worldwide web for people of all ages and abilities as long as they have internet access. The digital divide still exists but in time, no matter people's economic position, they should be able to cheaply, quickly and reliably access the web with basic digital and information literacies if supported by infrastructures that allow all schools and/or community centres to provide the means to this end. Disadvantaged communities and individuals should in today's world have equal access to education and to realizing their creative potential through arts learning experiences using e-learning and ICT tools. These opportunities may not have been so readily available in real-time, face-to-face environments, but with ICT there is the chance for more equitable access, which in turn can impact positively on the social, cultural and economic factors that shape our lives. Interactive, connective communities of practice can support teachers and learners in developing subject knowledge and key competencies essential to living and life-long learning for the 21st century: managing self; relating to others; participating and contributing; thinking; using language, symbols, and texts. ICT has the potential to enhance real world experiences through collaborative communities of practice.

Developments in virtual technologies are creating new and exciting approaches to arts learning and teaching that have never been conceived of before. For example, by combining real and simulated electronic environments 'media actors' can interact in virtual worlds of practice where creativity has the potential to be artistically explored, shared and experienced with others, in the widest possible range of learning contexts and environments.

E-learning allows different spaces and places for creating and sharing arts-making processes with others who are involved in similar endeavours, by providing opportunities to mentor and to be mentored beyond the limitations of the traditional classroom or school setting. By collaborating across what were once barriers of time, available

expertise, culture, and place, new perspectives and enhanced cross-cultural communication can be developed. Greater understanding between the peoples of the world is a vital goal in the volatile world of discontinuities that we currently live in. ICT and arts education is pivotal to achieving this goal.

In order for ICT to impact most effectively on traditional school-based arts learning and teaching, educators need to critically review available digital multimedia to assess advantages and disadvantages so that selection and utilization of digital resources and objects best meet the needs of particular students and learning contexts. The research has noted that teachers need support to implement ICT effectively in their arts programmes.

It is important that teachers are aware of progression in learning in the arts so that they can plan for developed use of ICT. As teachers and students selectively utilize digital assets to create their own digital materials and learning objects, there will be more meaningful engagement in learning and this can positively impact on student achievement. As identified in the research carried out in other learning areas (Loveless, 2002, Newhouse, 2002), it is also likely that when teachers are confident in using ICT they will be able to better integrate it into specific pedagogical approaches that enhance learning and effect long-term communities of practice. This should hold true for the arts as in other learning areas.

Finally, the purposes of utilising ICT in arts education need to be clearly understood by teachers, their students and the school community, including parents. What is important is to ensure a quality media culture of the future where student's safety is protected in cyberspace. The selection and utilisation of digital materials, and the interactive and connective pathways chosen, all need careful consideration to be of best social, cultural and economic value (in time, people and monetary senses). ICT in arts programmes can enhance both student and teacher motivation. It undeniably provides new ways of accessing information through the internet. The ever-developing range of sophisticated hardware, software, and multimedia digital tools allow new ways to manipulate existing and create new arts practices and transdiscipline or intermedia arts works, which can then

be shared and presented (both processes and products) in online, interactive environments. This connectivism allows for refinement and reflection in and on the creative processes specific to arts practices, and for opportunities to learn new, dynamic ways of thinking and knowing about arts and culture of the world's peoples for greater understanding and guardianship of the world in which we live.

Recommendations

Through this literature review many key messages for the provision and support of ICT in arts education have become apparent. The following recommendations are premised on the need to support learners and teachers in arts education to effectively use ICT for enhanced learning and for greater social and cultural collaboration across school, community and global contexts.

Initially it is recommended that New Zealand stakeholders:

- Identify innovative practices in schools and in the community
- Promote and share with networks of practitioners
- Establish trials with schools to video-conference and mentor arts teaching and learning, including artists in the community
- Research the outcomes of these trials
- Develop an area on Arts Online for ICT in each of the arts disciplines and across the arts, similar to the New South Wales Department of Education and Training website.

Concurrently, there is a clear need to establish systematic long-term research into and evaluation of pedagogy and creativity to investigate:

- The impact of specific uses of ICT on individual arts discipline and transdiscipline arts learning within particular topics of cultural and social importance, e.g. Māori and Pasifika student learning in the arts and the impact on achievement in other learning areas
- The effects of ICT on arts pedagogies, with consideration of new approaches that may be needed
- Student outcomes, particularly in researching new ways of learning in the arts (formal and informal, including the range of settings and contexts beyond the

classroom and into the arts community), and the assessment and evaluation of new knowledge learned

- The impact of ICT on curriculum in the arts in relation to the new curriculum of 2007 and its key competencies
- New ways of measuring attainment in the arts in response to new learning and pedagogical approaches through the use of ICT.

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