Chapter 8

Technology and the arts

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Digital technologies are increasingly intrinsic to all forms of art and hence arts education. This chapter presents justification for this inclusion, a process for minimising the misapplication of technologies to arts education, and a set of examples of the use of digital technologies in the arts: robotics, virtual worlds, and augmented reality.

Introduction

Wilson (2008) highlights the fundamental changes technology is having on the arts.

> What kind of preparation do artists need? Some would emphasise cultivation of personal vision and creativity, emotional self knowledge, intuition, and spiritual awareness. Others highlight technical skills of working with media, finding powerful ways to communicate, exposure to the great works of the past, and a strong grounding in art history. Still others stress skills of socio-political analysis, sensitivity to one's own cultural identity, and awareness of critical themes in understanding culture and media... Digital technology is significant but it is part of something much more momentous. Scientific research and technological development are doing much more than creating new gadgets and media. They are radically transforming basic philosophical ideas about the nature of the physical world, time, and space; the nature of life and intelligence; and the limits of our abilities to transform the world and humanity (Wilson, 2008, p.1).

Digital technology is all-pervasive. While opportunities to 'get away' exist, to the beach, the forest, or un-plugging for a holiday, these are the rare exceptions and increasingly so. For students growing up in a hyper connected digital world, play facilitated by computer games, social relationships brokered

by online networking, and an unrestricted overabundance of information and knowledge, the role of the arts in developing creativity, alternative perspectives, and enriching experiences remains vitally important.

Some have seen the arts as ancillary to a technological world created by scientists, mathematicians and engineers - but as that world mainstreamed, it is the artistic expression in movies, websites, computer games, virtual worlds, and even social media and personal publishing that define quality. The term 'Multimedia' has given way to the full expression of all areas of the arts in digital environments. Computer game credits list many more artists than programmers, websites focus more on aesthetics than complex function, cinematic quality computer animation is seamlessly incorporated into films, and photographs and music are routinely published and recorded with digital enhancement.

Avent-garde artists led these changes. While some arts educators resist moves from traditional practice, many more have embraced new technologies and used them to open up and revitalise artistic formats, combine forms, and challenge established dogmas. They use technology as a hook to interest students and as a tool to enhance teaching and learning. This chapter examines just a few of many approaches, but first provides a theoretical framework on how this can be achieved.

Theoretical Underpinning

Technology has unfortunately been often misapplied in education, computers (and scanners, graphic tablets, cameras, audio recorders, synthesisers, etc.) sitting unused or underutilised, software gathering dust on shelves, and approaches tried with great excitement, soon abandoned. In most cases, the technology was mismatched to the teaching approach, to the content being taught, or both.

The TPACK model (Mishra & Koehler, 2006) - Technology, Pedagogy and Content Knowledge, focuses on the intersections between these three areas (technology - content, technology – predagogy, pedagogy - content) and how the most effective learning occurs when all three intersect. Shulman (1986) proposed a PCK model following concern that teachers' content knowledge and pedagogy were being treated separately in teacher preparation programs and that the suitability or otherwise of particular pedagogical approaches to particular content was not being addressed. The consideration of content and pedagogy simultaneously provides a means to identify the content most suitable for learning, and the pedagogy most suitable to teach particular content, something not achieved when treating the two separately.

TPACK extends this model to include finding the best technology for a particular pedagogical approach, and the best technology for particular content. An interactive whiteboard may support direct instruction but be less suited to a constructivist approach. A digital camera may be very useful in teaching a concept in visual arts but less so for a particular musical concept. Where all three are supportive of each other, effective teaching and learning is more likely to occur.
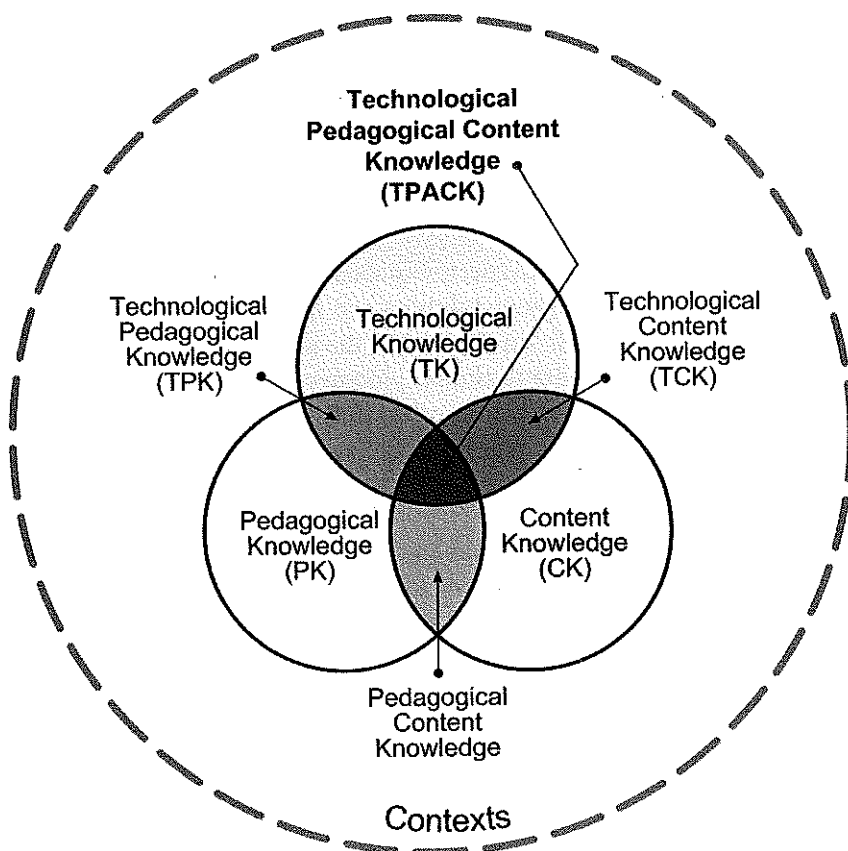
TPACK Model

It is when these do not align, either the technology is inappropriate for the teaching approach, inappropriate for the content, or the pedagogy is inappropriate for the content, poor teaching and learning is more likely to result and technologies are rightly abandoned.

Of course for some teachers, the challenge of incorporating technology into arts education extends beyond mismatches. Ertmer (1999) identified first

and second order barriers to change. Firstly there are issues such as acquiring the technical skills needed to operate the technology, lack of access to the technology, lack of time to plan, lack of administrator support, and lack of technical support. Then there are second order barriers such as intrinsic teacher beliefs about teaching, teacher beliefs about computers and technology, beliefs about arts education, beliefs about classroom practice, and unwillingness to change. These are challenges teachers must overcome to enact change.

But what drives teachers to change? Most often it is students. To remain relevant to students, teachers must understand and engage with the digital world in which their students live, work, play and learn. It is not entirely the world in which teachers grew up and gained expertise, but to remain apart is to risk anachronism. The question is how. Teachers will never be able to completely and continuously re-frame themselves fully to every generational change, but just as arts educators develop select expertise in their chosen art forms, there is an opportunity to develop select expertise in technologies that enhance these art forms and more generally enhance teaching and learning. Few artists today would contemplate engaging fully in all areas of the arts or even in all possible aspects of a single art form. There is similarly no need to develop expertise in all technologies. But there is a need to engage fully with some, to provide a sufficient compilation of in-depth experiences to support students in exploring technologies on their own.

The range of technologies that support each art form is immense and rapidly growing. Every arts education conference is full of examples from avent-garde teachers exploring their latest approach and technology to enhance arts education. But the latest approaches will not be for all, collections of approaches such as Arts Education 2.0 provide a wealth of ideas and strategies and it is here that the TPACK model can assist in identifying which technologies are appropriate for exploration. Not all technologies will work for every teacher, pedagogy, content or indeed student. Finding a technology to explore and meaningfully incorporate is an incremental process, but each new technology incorporation builds upon past experiences, becoming easier and more ambitious. Often it is a better strategy to start with a tried and true technology, one that while new, has the benefit of existing resources, examples and peer support. After mastering a few such technologies arts educators will be better placed to develop their own avent-garde approaches, incorporating teaching approaches they know work well with new technologies that combined, improve teaching and student learning.

Another approach is to tackle curriculum concepts that have proven themselves difficult to teach effectively. Exploring the technologies and

pedagogies available can often provide new perspectives on teaching practice and the impetus to improve student learning opportunities. Serendipitously just as classroom accountability and transparency have increased, so too have examples and resources in freely available online collections.

In the early 90's it might have been possible to list the various technologies and their approaches to arts education, today there are far too many - but technological tools, search engines such as google, and the shared publications of thousands of arts educators (and artists) via online websites and blogs, provide a wealth of support and ideas for arts educators.

A few include:

http://arted20.ning.com/

Art Education 2.0 is a global community of art educators exploring the uses of new technologies.

http://incredibleart.org

Incredible Art is a comprehensive collection of resources for art educators.

http://www.studio443.com/arttech

Art Tech provides tools, tutorials, virtual museums, and professional linkages to artists engaging with technology.

Blast is a BBC archive site developed for a TV series focused on the arts and technology with collections of short video clips to support a wide range of concepts and projects.

Australian Network for Art and Technology (ANAT) supports artists and creative practitioners engaging with science and technology and aims to bridge art, science and technology, enriching culture and industry, and generating new creativities.

Just as there is a wealth of online resources available, there are also many existing technologies that are being used effectively in arts education - interactive whiteboards, photo editing, synthesised music, digital cameras, iPods, digitising tablets, video analysis, stop motion animation, digital storytelling, blue screening, digital puppetry, online art galleries, and collaborative online performances to mention just a few.

These examples provide a range of opportunities to explore as an arts educator, but it can also be useful to examine in depth how arts education is using a few technologies, and by focusing on relatively avent-guard arts technology approaches, best highlight what may be possible with the next new technology that emerges. Many students are engaged by exploring the latest trends and technologies, and with the rate at which new technologies are emerging, there exists opportunities for students to be at the avent-guard.

The three examples we will explore are robotics, virtual worlds, and augmented reality.

Robotics

Robotics have long been used in education as a teaching tool, particularly in mathematics and computer science, but also in art. Piaget explored their use in arts education (Lansing, 1966; Mandelbrojt & Mounoud, 1971) and many artists

have incorporated robotics and animatronics into their works. The Robocup Junior international competition has included a specific dance category for over a decade and thousands of students have explored dance and technology through this approach.

Robotics and artificial intelligence research has long explored the capacity for art to be developed by machines, one of the latest being (Night, 2011) robots that perform stand-up comedy based on continuous feedback of audience reaction and previous success. Coupled with the many technological tools developed to expand or assist artists with their technical skills - graphics software, digital instruments, etc. there are increasing opportunities to assist artists with other dimensions of arts education - collaborative works, access to collections, performance and presentation of work, feedback on quality and improvements, online discussions and collaboration with practicing artists, and engagement with current debates as stimulus for artistic work.

Robotics is one of a range of simulations (Eidsheim, 2009) that are being used to improve student understanding of educational concepts. These range from dramatic storytelling (Ribeiro, Costa, and Pereira-Coutinho, 2009), demonstration of musical techniques, through to the exploration of scientific concepts via dance performance. Gesthuizen (2010) has used this approach coupled with traditional dance to enable refugee students from diverse NESB's to comprehend scientific principles.

Most schools, primary and secondary, have some robotic kits and there exists an opportunity for students in their study of the arts to creatively incorporate the use of this technology in the development of their artistic work. This could include musical accompaniments with robots contributing remaining band or orchestra members, collaborative dance routines, dynamic and interactive sculptures, or scripted sets interacting as part of a performance.

Virtual Worlds

Virtual worlds provide a 3D immersive environment in which participants interact with a participant created world and with other participants via customisable 3D animated representations of themselves known as avatars.

Second Life is one of several dozen virtual worlds (Second Life in Education, 2011) currently available for use or under development. As a Virtual Learning Environment (VLE), Second Life is being used for a wide variety of educational applications. Current categories include Distance and Flexible Education; Presentations, Panels and Discussions; Training and Skills Development;

Self-paced Tutorials; Displays and Exhibits; Immersive Exhibits; Roleplays and Simulations; Data Visualisations and Simulations; Libraries, Art Galleries and Museums; Historical Re-creations and Re-enactments, Multimedia and Games Design; Art and Music Projects; Literature, Composition and Creative Writing; Theatre and Performance Art; Virtual Tourism, Cultural Immersion and Cultural Exchange; Language Teaching and Practice, and Language Immersion; Awareness/Consciousness Raising and Fund Raising; Support and Opportunities for People with Disabilities; Politics, Governance, Civics and Legal Practice; Business, Commerce, Financial Practice and Modelling; Architectural Design and Modelling; and Urban Planning and Design (Second Life in Education, 2011).

Virtual worlds are being used by the artistic community for collaboration, presentation and as an alternative medium for expression. Second Life is oriented towards adult and upper-secondary use but virtual worlds such as Quest Atlantis (Quest Atlantis, n.d.) have explicit arts education programmes developed for middle-years students and most virtual worlds permit creative contributions by participants.
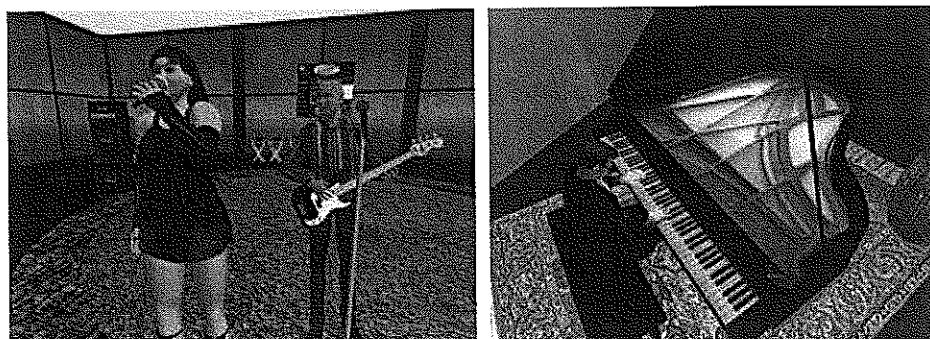
A study (Zagami, 2008) into the use of virtual learning environments (VLE) for the teaching of arts education skills to pre-service primary school teachers explored Dance, Drama, Media, Music, and Visual Art. Within the VLE students were able to create their own artistic works and performances.
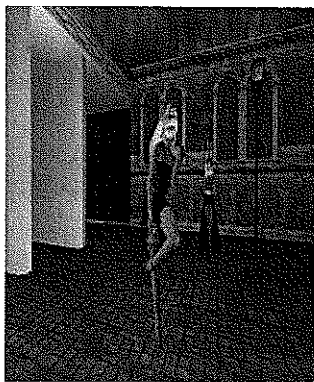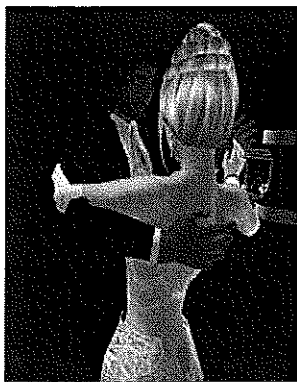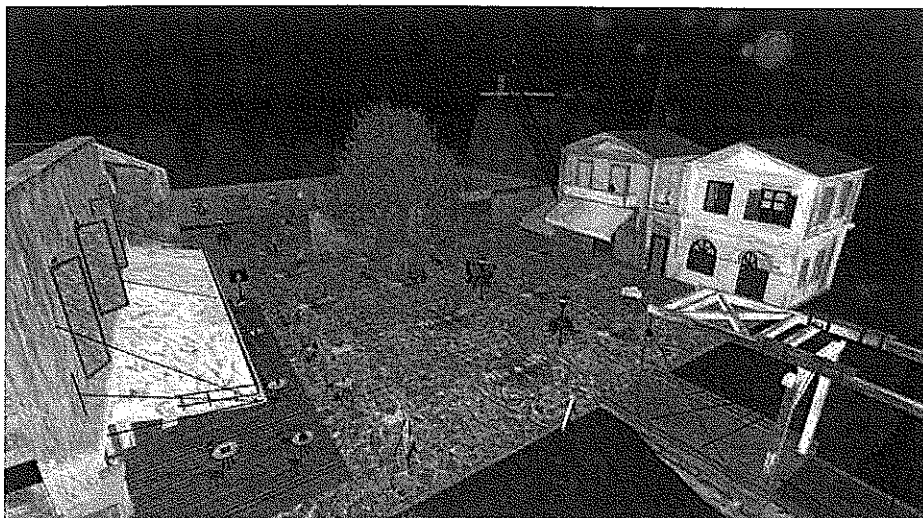

Second Life Dance
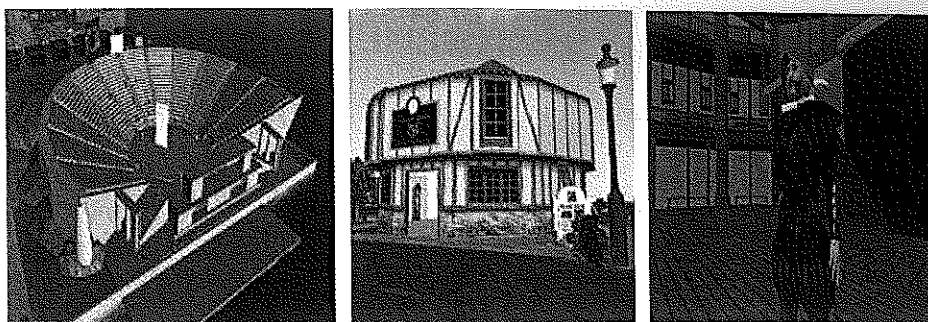
Second life Drama

Second Life Music

Second Life Dresden Art Gallery and Sistine Chapel reconstructions

Virtual Starry Night, Van Gogh exhibit

Students studying arts education in the virtual learning environment used a series of locations within the Second Life environment that included art museums, artistic instillations, audio streaming of physical and digital musical instruments into the second life environment, creating and using a range of costumes and virtual avatars for dramatic performance and role-play, using and creating a range of sets for digital storytelling and drama, using digital imaging tools and video editing software to create artworks to be displayed within the virtual environment, combining and creating animation scripts to replicate dance movements and generate individual and collective performances, and rapidly modifying in real time all of the above in response to audience feedback.

The study (Zagami, 2008) found that both conventional and virtual learning environment approaches to the development of primary arts education skills have instructional advantages depending on the skills being developed. For the participants in the study, drama skills were generally more successfully developed using the virtual learning environment, however, visual arts skills were generally more successfully developed by participants in this study using conventional approaches.

The success of the virtual learning environment approach to develop skills in drama, and to a lesser extent dance, were attributed to the structured and scaffolded nature of how students approached the development of these concepts in the virtual environment. Students reported that the use of formulaic procedures to support the creative development of performances and their

ability to rapidly manipulate the environment to trial, test and perfect their work as the greatest advantages of the environment.

The success of conventional approaches to the development of visual arts skills was attributed by students to the constraints of software tools in the virtual learning environment and their inability to master complex tools within the time available compared to students able to more fully utilise their prior experience in drawing, painting and sculpture.

This study reinforces the need to apply the TPACK model in ascertaining the effectiveness of a particular technology to a body of content and pedagogical approach. The study focused on skill development but the same holds true for concept and creativity development and the full range of arts education outcomes. Virtual learning environments offer an additional set of tools available for art teachers and students to engage with arts education. Second life is freely available for use in upper-secondary (though costs exist to create permanent works), Quest Atlantis requires teachers to undertake a free short course before use (Quest Atlantis, n.d.) but ensures only students and teachers have access to the environment, a few schools have setup their own virtual learning environments (Skoolaborate, n.d.), and some school systems (Education Views, 2009) have developed systemic environments for use by their schools.

Virtual worlds are full of artists, indeed they could not exist without them as the environment is entirely built by the creative efforts of participants. Many art schools require use of virtual worlds and several major arts competitions are being held in Second Life. While initially daunting for teachers given the scope and potential of virtual worlds, these environments are designed for easy navigation and artistic creation. Students can quickly learn the technical skills involved themselves and focus appropriately on creative expression.

Augmented Reality

The final technology we will explore is Augmented Reality. This represents a new way to view the world, explicitly enhanced by technology. An environment that includes both virtual reality and real-world elements. For instance, an AR user might wear translucent goggles; through these, he could see the real world, as well as computer-generated images projected on top of that world (Azuma, 1997).

Augmented reality represents a new frontier in our interactions with technology. Through the use of mobile devices, augmented reality software

extends the rich engagement possible in simulations, computer games and virtual world environments on desktops, to our interactions with the physical world.

Currently, mobile phones and similar devices provide the window through which we view augmented layers of information about the physical world. Showing the location and distance to ATM machines for example, overlayed on the phones camera image of the world. This could as easily be the location, information and updated price of artistic works in a gallery or name, statistic, and lyrics of a band member.

Various groups (ARLab, n.d.) are exploring the artistic opportunities this interaction of virtual and real world may afford. Services such as Layar (n.d.) facilitate the easy production of augmented reality layers by artists, while other groups are working on ways to make the technology transparent, such as the development of augmented reality contact lenses (Babak, 2009).

Museums were one of the first environments for augmented reality (Wojciechowski, 2004) but art galleries are now engaging with these technologies on a grand scale (Google Art Project, n.d.) to provide access to their collections as easily as using online maps. The layering of additional information about works while viewing exhibits will provide a richer engagement with traditional works, while works specifically designed to be experienced through technology will expand our understanding of installations and provide a range of new artistic opportunities.

Several children's books have already been made into augmented reality texts in which instead of viewing a static 2D image, children can view images, scenes and models from all sides as they manipulate their book and watch animated scenes come to life to accompany the narrative. Tools such as ARSights (n.d.) already exist to enable teachers and students to make their own augmented reality texts.

The dramatic arts have long augmented audience experiences in radio, television and film performances. Full body motion capture and computer generated avatars now take this further and augmented layers of experience are enhancing live theater productions (Palis, Medina, Mariano, and Paterno, 2008). Finally, John Mayer (Hart, 2009) became the first musician to create an augmented reality music video in which the viewer via their webcam is included as an extra in the performance and there is an ever increasing range of digital musical instrument applications on mobile phones to create, share and collaborate on musical performances.

Educators have these examples and many other opportunities to introduce students to emerging technologies that let them explore artistic mediums in new ways. Combining student interest in technology and the new with grounding in an art forms' fundamentals meets the needs of many students and teachers. Technology and the arts is not however without significant challenges, personal and systemic. Copyright and intellectual property issues continue to struggle to remain relevant to emerging technologies and student reuse of existing material (Stoner & Abrahams, 1996). The perceived relevance of arts education within an increasingly crowded and evolving curriculum remains an ever present concern, and there are increasingly opportunities for self instruction for artistic skill development, but engagement with the arts beyond skill development will continue to remain central to the arts educators' relationship with their students and society.

Finally, it is not the particular technology, pedagogy or arts content that will define success. It is modelling to students an engagement and passion for learning. Students are learning new technologies constantly, they are well versed in exploring how new technologies can be applied and in self directed learning of the technical aspects of technology, often supported by a strong personal learning network of their peers. They expect to explore new technologies as they engage with the arts. An educational environment devoid of this cannot be conducive to their learning and interest. Be it a student wanting to learn and play the latest synthesised musical instrument on their iPhone, creating 3D visual models for a computer game, programming their avatar to perform a dance routine, or retelling Macbeth using Lego characters - this is the technologically immersed world in which our students will explore the arts, with or without expert guidance. But they certainly can still appreciate supportive art teachers, grounding them in the fundamentals of artistic expression and skill, modelling to them the opportunities that technology brings to explore new perspectives in the arts, and encouraging them to find their own artistic voice in their richly technological world.

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