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Virtually there:
Real-time interactive technology applied to instrumental music teaching

ABSTRACT:

Individual instrumental instruction is considered an essential component of traditional training, one which institutions continue to employ despite a climate of shrinking resources. With increased access a priority, music institutions are challenged to find ways in which students might receive quality training both on and off-campus. Of particular importance to tertiary institutions is that pre-tertiary students receive quality teaching which will ensure they are competitive in the auditioning process. For countries where distance is a factor in the provision of equitable access to quality teaching, interactive technology is proving an innovative response to the needs of students in remote locations. Whilst presently it is used primarily to service pre-tertiary students, some examples demonstrate how it might be employed in future tertiary programs.

This paper emerges from recent research into the use of technology in the delivery of tertiary and pre-tertiary music training particularly in Australia, and it addresses the challenges of teaching instrumental students using realtime interactive technology, based on the particular example of the *VideoLink* Program at Sydney Conservatorium of Music. It explores the medium through the experience of those participating in this and other similar programs, suggesting potential future applications of the technology at tertiary level.

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Introduction

For conservatoires, individual tuition has always been the foundation upon which music training is built. Since the end of the eighteenth century when they began to emerge as elitist schools intensively focused on producing professional musicians (usually performers) of high calibre, conservatoires have fostered the relationship between maestro and student as one of the most crucial elements in music training. Now, amid the contemporary blurring of boundaries between vocational and academic programs, the focus on individual tuition by resident and visiting professionals remains one of those features peculiar to music institutions. However in those conservatoires which are part of the higher education sector, it is this feature which is under constant threat from a growing tide of economic rationalism. The 'reflective' conservatoire has here become the defensive conservatoire, leaders forced to defend the very essence of that training which has long been the foundation on which conservatoire programs are based.

Contemporary conservatoires confront the argument that the Western classical music culture on which they were founded is no longer central to music training. Accordingly, in recent years some conservatoires have begun to move away from the traditional classical genre and incorporate a broader range of musical styles. Others have chosen to specialise in new forms. But no matter what the musical genre, the provision of quality tuition continues to be important, arguably even more so where access is high on the list of government priorities. In music, access at tertiary level is highly dependent on prior experience, and thus the issue of quality tuition extends beyond the higher education sector and into the wider community.

The winds of shifting government policy are blowing through conservatoire corridors. In the USA the face new funding guidelines which have them relying more on philanthropy than ever before. The Bologna Declaration has required European conservatoires to conform to a unified system of assessment and quality assurance which encourages mobility for faculty and students. The Higher Education Funding Council of England now requires institutions to ensure broadening access and successful graduate outcomes. Australian conservatoires have been forced into shotgun marriages with university partners, and many are now obliged to engage in globalisation and flexible delivery. The need to address flexible modes of delivery causes conservatoires to question their original raison d'être: is it possible to deliver training in the most essential element - music practice - from a distance? Thirty years ago, the suggestion would have been considered implausible. Now, in this climate of internationalisation, shifting funding guidelines, broader access, and students who consider technology commonplace, the concept would seem relevant to institutional objectives and student needs. Progress, however, remains tentative at tertiary level. In Australia, it would seem that community conservatoires might lead the way.

The reluctance to deliver tertiary music training via such interactive technology is easily explained. With performance-based programs predicated on the expectation that instruction includes a high percentage of one-to-one tuition and ensemble performance, training from a distance has seemed impossible. But this conventional focus ignores the

contemporary argument that future musicians will need to be more flexible, and more connected to the audience (de Haan; Gregory; Renshaw). It also overlooks the emergent role of technology in the artform itself. Recent developments in interactive musical composition and performance on the Web demonstrate quite clearly the potential for creative activity in real time across unlimited locations. Composer William Duckworth describes his interactive composition *Cathedral* as "almost unimaginable, and certainly physically impossible, a mere decade ago" (Duckworth, The Perceptual and Structural Implications of "Virtual" Music on the Web). An interactive website with web-based musical instruments that anyone can play, this piece blurs the distinctions separating composers, performers and audiences, offering each individual listener the ability to create his or her own unique musical experience online (Duckworth 4). That this web-based performance is non-elitist and accessible to anyone without audition demonstrates the relevance of this technology to broader access and the wider audience.

Not all realtime performance is non-elitist. There are many examples of interactive computer-mediated performances, particularly among American conservatoires. As part of its Ultra-Videoconferencing Project, McGill University in Canada has been developing both interactive teaching and performance. They claim to have produced the world's first demonstration of high quality internet protocol performance in a violin duet presented in 2001. Although separated by several kilometres, the two players were able to hear one another in "near realtime" with approximately 20ms delay, allowing them to synchronize their playing as if standing together on the same stage (McGill).

Despite this progress, most conservatoria have maintained a blinkered approach to music learning via interactive delivery. No more. Recent improvements to computer-mediated technology now demand attention. The realtime videoconference link via internet protocol is fast, efficient, cheap and accessible. However, like all computer technology, it comes with benefits, complications, and the inevitable firewalls.

Videoconferencing – what is it?

Videoconferencing is not new. It has been present for many years in live television crossovers and in some countries, universities and colleges have applied videoconference (VC) technology to link campuses in different locations with a single lecturer on another (or even the same) campus. That it has been in use whilst still developing has given it a difficult birth in some circles. Those universities employing early versions of VC technology were often frustrated by slow response rates and poor audio and visual qualities. The first few who tried to apply it to music teaching gave up very quickly[1]. For those visionaries who did not give up on the concept, their faith has been rewarded in less than a decade.

[1] For example, an enthusiastic but brief trial of instrumental lessons conducted between Sydney teachers and the University of New England in the early 1990s were frustrated by slow, insecure and expensive connections.

A realtime VC link is made possible via a broadband or phone connection linked to a video camera. At its most basic level, a VC system requires a computer, a camera, at least one video monitor, and a link to a telecommunication network in each location. Additional audio speakers can improve the sound, additional cameras at the student's location improve options for the teacher, and a second monitor at the teacher's location shows the local picture in full size instead of as an inset on the main image. At a more advanced level, all components are combined into highly-developed single modules which can be made to order.

Depending on the available technology and connection, the audio and video links may occur in 2-way or 1-way permutations but for the purposes of instrumental teaching, a 2-way video and audio link is essential. As an internet link using an Internet Protocol (IP) address, a broadband connection is cheap, fast, and accessible. The phone alternative, an Integrated Services Digital Network (ISDN) connection is slower, and is costed according to the speed required, making it potentially very expensive. As Tait and Blaiklock explain, "remembering that the ideal connection speed is 512 kbps, a 128 kbps connection will cost around [AUD] $33 per hour" and there is a suggestion that the high cost of ISDN to both organisation and student defeats "the very philosophy of equity" (3) that the employment of such technology attempts to address. Nonetheless, some would still defend its use as better than nothing at all (Walton, Interview).

Music from another room

Violinist Pinchas Zuckerman often resorts to VC technology in order to maintain contact with his students at Manhattan School of Music when he is undertaking performance commitments elsewhere (U.Brand). He also participates in distance masterclasses with other institutions, including McGill University. Zuckerman is very positive about the medium:

> I can see a student's fingering up close, analyse the problem and then send them fingerings and bowings with live graphics. This provides the student with […] follow-up. It's not just a one-time thing because the lesson can be reviewed when it's over, and in several weeks I can come back and see if and how his playing has improved. (Cary)

Zuckerman's support of the medium, together with projects at Oklahoma University and the New World Symphony in Florida "have shown that videoconferencing can be used successfully to teach [instrumental] music, conduct masterclasses and produce collaborative performances" (Callinan 16). The American examples make use of very high broadband technology available through Internet2 (www.internet2.edu/), a facility which underpins various projects across a consortium of universities and institutions. Illustrating the versatility of the medium, some of these projects are

> A performance event showcasing regional dance and music from numerous campuses; […] musical theatre with 'Broadway Local' in which students at Manhattan School of Music and Columbia interacted with Oklahoma University to perform; a music masterclass and discussion; […]; the Remote Barbershop

> Quartet; […]; a musical linking performers in Troy and Manhattan into a single musical presentation; [… and] Pinchas Zucherman teaching a violin student in Canada (Internet2 website qtd in Callinan 16-17).

McGill University claim a world first with a cross-continental jazz performance in October 2002. Performers from McGill and Stanford University in California played together using the Ultra-videoconferencing system which has been specifically developed at McGill as a "low-latency IP transport system for audio, video, and most recently, vibrosensory data". They have used the system in live concert streaming since 1999, and also in remote mixing, collaborative performance, distance master classes, and remote video interpreting of sign language (McGill).

In September 2003, a live concert held in Verburgghen Hall at Sydney Conservatorium was delivered via VC to Perth (Western Australia) and Armidale (NSW). Using large bandwidth for fast delivery of high quality, made it possible for audience interaction between all the sites after the concert. This demonstration was produced by the CSIRO to demonstrate the potential of interactive performance across remote locations. Such examples endorse the conviction that "the issue for the twenty-first century will not be whether to use technology and multimedia in music teaching, but how to use it effectively" (Uszler, Gordon and Smith).

Australia may have a long history in distance education, but it lags behind the USA in the delivery of realtime instrumental instruction and performance in the higher education sector. The most flexible approach to distance learning in tertiary music is offered by Central Queensland Conservatorium of Music (CQCM) via the ***Virtual Conservatorium***. This model sets out to demonstrate that the physical environment needs no specific location: a virtual institution "doesn't need to look like a school anymore" (O'Grady 3), so resources can be directed primarily to content and delivery. Students remote from the Conservatorium receive "a mix of electronic delivery, intensive mode delivery and software based learning activities" (Bofinger and Whateley 1). Although VC technology is available and used by other disciplines in the same university, the *Virtual Conservatorium* avoids it altogether, instead commissioning teachers located nearer to the students for regular face-to-face coaching, supplemented by occasional intensive mode delivery on campus or in a nearby metropolitan area (Voltz).

Determination to maintain face-to-face teaching of any kind may undermine quality. The **VideoLink** project attacks the problem from a different perspective, prioritising quality for the student irrespective of location. Established in 2000 by Mark Walton, it responds to the need for regional students to have early and regular links with quality teaching from Sydney Conservatorium. Frustrated by constant travelling in his independent efforts to reach remote students on a regular basis, this clarinet teacher from Sydney Conservatorium single-handedly found sponsorship to set up a realtime teaching link between the Conservatorium and regional centres across the State. His successful initiative eventually earned him the role of Chair of Performance, Outreach and Communications at the Conservatorium.

The benefits

VideoLink makes it possible for teachers in Sydney to provide individual instrumental instruction via VC to students in remote locations. The greatest advantage of the concept is that it provides access, removing "some of the problems of isolation experienced in regional New South Wales: and [reducing] some of the distinctions that exist between city and country areas" (Callinan 151). In most cases, the students are pre-tertiary, and VideoLink is therefore an effective means of improving the size and quality of future Conservatorium intakes, making it an important asset for the Conservatorium. As a prime investment, the project has been of little cost to the institution thus far. A single room at the Conservatorium has been allocated to the project, housing the computer, camera and monitors supplied to the project. Despite his new title, Walton has been waiting for since mid-2004 for some indication of ongoing commitment from the Conservatorium. Currently the project relies on his availability and that of a few believers (Email).

The technology employed by VideoLink is relatively simple. Connections may be by phone or internet and whilst the results are different for each, current technology makes the prospect more feasible than it was a decade ago. Developments in high-speed broadband networks now deliver accurate representation of both picture and audio (Callinan, Tait and Blaiklock), and failure of the technology is less common now than in the initial years of the project. As Tait explains "technology can fail (but so can a car)" (Email 1).

Callinan's study found that having a lesson with a teacher from Sydney Conservatorium highly motivates the students involved (151). Motivating the teachers has been more difficult. Concern regarding teacher commitment caused Walton to include students in his work, training them to provide VC tuition to regional students. By doing so, he has already developed a new generation of teachers accustomed to the medium, and some are now teaching in remote locations. For those now working in regional centres, using VC with their students has the additional benefit of an ongoing mentoring relationship with Walton. Jenny Binovec in Coonabarabran is a former student of Walton's now teaching in Coonabarabran. She says of the system

> Its [sic] really great that we have the resource available to regional areas where visits by brass teachers and/or examiners are not frequent and it cuts out the travelling time of 7 hours from Sydney! It is a great opportunity for my students to experience expert advice from various people. Also my younger students (primary) are captivated by the whole process - the technology, the screen, volume and zoom control. (Email)

One of the most VC-proactive of these regional centres is the Riverina Conservatorium, a pre-tertiary community school located in Wagga Wagga, 475km south-west of Sydney. The Riverina Conservatorium has taken the VideoLink project one step further by employing it at two levels – to link advanced students at the Riverina Conservatorium with teachers at Sydney Conservatorium, and to connect staff from the Riverina Conservatorium with students in remote areas beyond the regional base. Moreover,

whereas Walton commenced VideoLink using wind and string teaching, the area most developed at the Riverina Conservatorium is piano. Recently, VC was used to examine some students in another remote location, Coonabarabran, 465km north-west of Sydney.

Director of the Riverina Conservatorium, Hamish Tait is determined to further develop the technology and the accompanying pedagogy. He confirms that videoconferencing via an internet address is economical to install, operate and facilitate, and teaching in this way reduces costly travel time which allows teachers to access students in remote locations without leaving the Conservatorium. Some are in the town of Hay which is 300km west of Wagga, where "there are no, I mean no, music teachers within 150km of [that] town", and "at least two guitar students, a handful of clarinet/sax students and several brass students" benefit from studying with teachers at Riverina Conservatorium via VC mode. At the other end of the spectrum, advanced students at Riverina Conservatorium have regular access to the experience of such teachers as Mark Walton (clarinet), Jeanell Carrigan (piano), Phillippa Paige (violin) and Emma Knott (flute), all teachers at Sydney Conservatorium (Email 2).

The complications

Amid the positive advantages of new media, new artistic outcomes, and a new style of graduate flexible enough to meet future demands, technology acts as both advantage and barrier. Technology may be moving quickly across global spaces, but there is yet to be a standard common to all. Tait notes that "internet based VC is the best option providing the bandwidth of the internet connection is fast enough [and there is] a symmetrical connection with equal upload and download capabilities" (Email 1). Experienced VC educators suggest that no matter what brand of equipment is installed, all sites should be the same because the same equipment gives seamless interactive technical fit, resulting in better resolution picture and audio. Different brands of equipment have different menus and this may cause problems for teachers and students using different systems (Smith, Interview). As Tait confirms, "the internet option is only applicable if both ends have similar connections. The system will only work as well as the weakest link" (Email 1). The major limitations for regional Australia are the cost of equipment and the availability of broadband. Whilst more readily accessible than fast broadband connections, ISDN is "extremely costly to use" (Tait Email 1).

Despite the potential hazards normally associated with technology, most difficulties experienced by VideoLink relate to pedagogy. Teachers are the crucial element: "you need a certain type of staff to make it work, that's the greatest threat, there needs to be a shared understanding and enthusiasm for it" (Voltz 4). Callinan's study of the VideoLink program found that because of the more extensive time involved in prior preparation and follow-up, teachers need to be extremely committed and prepared to change their teaching approach to suit the medium. They need training in details and teaching modes specific to the medium, including the ability to communicate effectively in concise sessions: "clarity of verbal communication [is] very important in this situation" (Tait and Blaiklock 4). Eye contact is particularly important in reducing the sense of isolation, and

it can be easily achieved by directing attention at the monitor above which the camera is situated. Interactivity and building relationships between teacher and students is critical to the success of a VC program. Binovec explained the limitations for Sydney teachers in developing a rapport with students in Coonabarabran:

> Having someone on a screen for a student can seem rather distant for them and unconnected, especially if they have never met this person "face to face". I feel the teacher on the other side [i.e. Sydney] needs to work harder to make the lesson work. (Email)

It stands to reason that all users must be familiar with the technology (Callinan; Searle and Mandile). Beyond that, teaching via VC requires intensified perception from the teacher: "teachers using videoconferencing [need] to have a high skill level and be very experienced in teaching to enable them to deduce what the videoconferencing does not allow them to fully assess" (154). They need to adapt to the physical differences. Referring to piano teaching for example, Tait and Blaiklock note a lack of ability to view the student from a 360-degree perspective, requiring the teach to "develop methods of determining from a single viewpoint how the student is sitting or whether the opposite hand is positioned correctly" (4). The Riverina Conservatorium employs a Polycom VC system, and this comment assumes a single camera on the student, normal to most situations. Recent alternative systems such as those developed by Tandberg have improved the camera rotation to almost 360 degrees (Siefert, Interview). Nonetheless although the camera range may have restrictions, picture quality is very high. Tait and Blaiklock note that teachers are able to zoom to a close view of the student's score, fingers and even fingernails (4).

Research has shown that "power distance" may increase by magnifying the teacher's image on screen (Filipczak), so the placement of the teacher's camera needs careful consideration. Some manipulation of the zoom may be necessary when the teacher is demonstrating to the student, but Walton suggests that the less a student is required to think about the technology, the more effective it is. He recommends that there may be someone else with the student (perhaps the local teacher) to make such adjustment's for the student if necessary (Interview). The Conservatorium teacher is able to adjust the view of the student remotely (without the student even being aware of it) in order to obtain a closer view of their posture or movement. Because of this potential for restrictions on visual stimuli, Tait and Blaiklock note that "the need for aural information [is] much greater" (4).

Sound quality is "critical to the success" (4) of VC programs for instrumental music lessons. Audio quality in contemporary television speakers is now better than ever before, but it is possible to further enhance the sound by incorporating high quality microphones and audio speakers into the smarts of the system. Without high resolution speakers, the sound may be "far from perfect", limiting demonstrations (Binovec). Binovec explains that with such limitations the Sydney teacher may not hear whether the student is tonguing properly, whether the student might be flat or sharp or it may be slight distortion of the sound, or if their tone is harsh or it is only the speakers. As she explains, "Sometimes its hard to tell" [sic] (Email).

Beyond the concern for quality, there may be some delay related to the particular connection speed if ISDN is being used. Where they occur, delays in transmission may complicate the pedagogical challenges. As Binovec explains, with any delay "the teacher is unable to beat the time, play duets, so there has to be me (or someone else) on the other side to do these things" (Email). On the other hand, with fast broadband connections as are available at the Riverina Conservatorium, "this delay is naturally overcome and students are rarely bothered by it after the first minutes" (Tait & Blaiklock 4) and there are "no pedagogical disadvantages to either student or teacher" (Tait, Email). Either way, despite technical limitations, Binovec still insists that "the system works very well and is a definite benefit" (Email).

Whilst demonstrating the effectiveness of tuition using realtime technology, the VideoLink program nonetheless continues to maintain the importance of interaction without technology. Apart from the local teacher's involvement in the VC lesson, this model also intersperses videoconference tuition with occasional face-to-face encounters with the specialist teacher. Ideally, neither mode should be exchanged for the other: videoconferencing enhances traditional instruction (Callinan).

The inevitable firewalls

The greatest challenge in this concept is overcoming a traditional mindset, or the firewall "of the mind" (Coghlan, Fox and Finkelstein). Even if there is increased acceptance of the interactive mode, teachers still need to adjust to the new medium. Another significant firewall is that which protects the traditional musical forms. VC lends itself to greater diversity in music training, giving the next generation of musicians the option of preparing for a different kind of professional future. It allows flexibility to move beyond the firewall which shields traditional styles. Interactive opportunities already available demonstrate the opportunity for experience on an individual level, tailored by the learner as well as the teacher.

The future for training in the performing arts must recognise the emerging role of technology not only in delivery of the training but also in creating the art. Both transform the traditional approach to training performers: VC makes a performance degree a possibility for students in remote locations and it has the potential to transform the way musicians perceive their work. The new generation of performers may find that learning from a distance in the digital age allows them a flexibility which transforms their access, their development, and their artform.

What next?

The new technology unlocks many possibilities for the future. In a moment of radical conjecture one might imagine a virtual provider offering a supermarket of program options and delivery modes across borders and cultures, some of them in collaboration

with existing institutions elsewhere in the world, some with professional organisations linking students to industry prior to graduation. In a more immediate scenario, a promising performer might connect with a maestro elsewhere in the world for regular tuition, and with like students in another conservatoire. An orchestral student might be linked with a professional organisation, creating a transition into the industry after graduation. A contemporary musician, might have his music linked to online production long before graduation. Cooperation is possible across cultures, countries and artforms to extend the experience of performance and composition students. Programs might encourage staff and student mobility, allowing participants flexibility to reside nearby or afar at different times during their study. Mixing the media appropriate to the individual project and the available resources allows unique programs to develop for specific needs.

Conjecture aside, VideoLink and the American programs demonstrate that VC is feasible for music tuition. The examples given here cover a wide range of tuition from community music schools to professional training, and through the use of VC, the distance between the two extremes is shrinking. Already VC is creating links between specialist instructors and individuals or small groups to overcome the tyranny of distance when the teacher is travelling or the student lives in a remote location. Although most proponents of videoconferencing see it as "an enhancement or supplement to face-to-face teaching rather than a replacement for it" (Callinan 18), it is impossible to predict its future potential. For the moment, in locations like the Riverina Conservatorium and Coonabarabran which are remote from major cities, it makes a huge difference to students and teachers, and a significant contribution to the size, quality and adaptability of the future tertiary music pool.

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