

DubDubDub: Improvisation using the sounds of the world-wide-web

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Abstract

DubDubDub was an educational project conducted by staff at Egerton High School, Manchester Metropolitan University and UCan.tv. It introduced a new type of musical instrument to the classroom, the DubDubDub player, which developed pupils' musical performance and improvisation skills by using the sonic environment of the Internet. Users of DubDubDub remixed the sonic content of the Internet, arranged sounds and prioritised them in real time to form new musical works. The name DubDubDub references the three 'w's of internet URLs: <http://www>. The musical improvisations generated by DubDubDub can be combined with other instruments as illustrated during DubDubDub's first performance at the Discourse, Power and Resistance conference(hosted by the University of Plymouth and Manchester Metropolitan University on the 21st April 2006). This paper reflects on the development of DubDubDub and this first performance, providing an insight into how new instruments can be designed to support contemporary approaches to music education.

Introduction

Musical performance and improvisation with new technologies is an emerging focus area for music education. Whilst many researchers have investigated the range of applications of technology towards the teaching of musical composition (Savage 2002 & 2003**add references), the use of new technologies to help pupils develop performance skill or technique in classroom settings is rare and less widely reported in the literature. There are some notable exceptions to this, however, particularly in the field of music education for pupils with special educational needs. Here, innovative products such as the Soundbeam (Soundbeam 2007) have been used for many years.

In contrast to the rather limited application within education contexts, contemporary musicians are developing, building and performing with new instruments on a regular basis. There is a yearly conference devoted to 'new interfaces for musical expression' (NIME). A review of the research evidence from conferences like this provides a useful backdrop the DubDubDub project.

Blaine (2005) starts from the position that many young people today have a familiarity, and significant dexterity, with a range of potential performance interfaces. Her investigation includes the application of a number of games controllers as musical instruments. Whilst discussing how a user might learn a new instrument, she suggests that:

Musical instruments must strike the right balance between challenge, frustration and boredom: devices that are too simple tend not to provide rich experiences, and devices that are too complex alienate the user before their richness can be extracted from them. In game design, these same principles or learnability are the fundamental principles of level design used to build an interest curve to engage players. (Blaine 2005, p.28)

Oore (2005) picks up on a number of these points. Like Blaine, his first concern is with technique and how this is developed with a new instrument. His key question is ‘What does one do with a complex new digital instrument?’ (Oore 2005, p.60). Like Blaine, he makes the obvious point that if an instrument was designed to be ‘easy to master’ it would quite possibly not be that interesting to play or to listen to once the initial novelty of the instrument had worn off. Secondly, he goes on to analyse a range of general concepts that, he suggests, might apply to the learning of a new instrument. These are couched under a statement that ‘the individuality of a musician is manifest in their learning process as much as in their performance’ (Oore 2005, p.61). Whilst this might be true, it is not a lot of help for the educator, who has to presume that there will be a common sequence of learning for the majority of learners and prioritises knowledge accordingly. But the important point here for the DubDubDub project is that the process of learning to control a new instrument and explore its musical potential is a vital element of an overall learning process that can not be short-circuited. Additionally, how a user learns a digital instrument is an important consideration in that instrument’s design. As he states in his concluding paragraphs:

The new-instrument performer must often be the initiator and driver of the exploration of the new instrument. ... The true creative journey begins when the user’s own goals and style drive the learning, and when basic elements begin to be internalized and built upon. (Oore 2005, p.64).

Buxton asks questions that should be central to educators’ thoughts when using new technologies to promote musical performance in the classroom: Why should musical performance be live? What difference does it make? For Buxton, musical performance is a compromise between the presentation of the scored and the improvised where physical, emotional, gestural, active and reactive components all have a part to play. He draws up a continuum within which the visibility or invisibility of musical cause and effect outwork:

I must confess, that I have the same emotional and intellectual response to watching someone huddle over a laptop as I did 20 – 30 years ago when they were huddled over a Revox tape recorder. The more invisible the gesture and the more tenuous my perception of the correlation between cause and effect, the less relevant it is to me that a performance is ‘live’. (Buxton 2005, p.4)

As we will see, a key informant to the DubDubDub project was to keep music live within the classroom. In an age where more and more pupils are huddled staring at

computer screens in their music lessons, DubDubDub sought to place an emphasis on live performance in small ensembles at the heart of music education for Key Stages 3 and 4. An introduction to the DubDubDub concept is well overdue.

The DubDubDub Concept

DubDubDub was a project conducted by staff at Egerton High School, Manchester Metropolitan University and UCan.tv. It introduced a new type of digital musical instrument to the classroom, the DubDubDub player, which developed pupils' musical performance skills by drawing on the sonic environment of the Internet. Within this context, users of DubDubDub remixed the sonic content of the Internet, arranged sounds and prioritised them in real time to form new musical works. The name DubDubDub references the three 'w's of internet URLs <http://www>. The initial aim of the project was to develop intuitive software instrument that would facilitate effective control of live Internet audio and then to use this tool in a performance setting. The first DubDubDub performance took place with a string quartet from the Royal Northern College of Music and a group of MCs and DJs drawn from an extended schools project held at Egerton High School at the Discourse, Power and Resistance conference (hosted by the University of Plymouth and Manchester Metropolitan University) on the 21st April 2006.

Pupils at the Heart of DubDubDub's History

"Adults fink they no bout lyf." (Lyric from UK TRAP delivered during the DubDubDub project by 'Impulse', a Year 10 student 'reppin' [representing] the L.T.C. (Lyrically Talented Crew).

Egerton High School is a special school for children statemented with social, emotional and behavioural difficulties in Trafford, Manchester. All pupils have been excluded from main-stream schools in the local authority and have significant gaps in their learning. The project leader and co-author of this paper was the Expressive Arts subject leader and ICT Co-ordinator at the school. DubDubDub was born out of his own artistic practice and the opportunities that have arisen from working alongside pupils at the school. This work has embraced interdisciplinary projects that include music technology, film-making and critical studies.

Many of the inspirational features of this work came from the pupils at the school themselves. For them, music, rapping, beats, DJ-ing and MC-ing are common features of a rich artistic sense of self-expression and a normal part of their day-to-day lives. Through working alongside these pupils as an artist, teacher and co-learner, the project leader developed an interest in how chance informed both his own and their work. In particular, the synergy between music, visual media and technology has been a source of inspiration. The freedom of expression that this synergy brings allowed pupils to make sense of the ubiquitous violence and problems that permeate throughout their lives, sharing and communicating solutions through forming and performing in music-focused 'crews'. These groups include DJ's, MC's, beat programmers and producers. Lyric writing (the construction of 'bars') is prolific, their use of music hardware highly skilful and pupils are adept at using a range of freeware,

shareware and professional software tools for musical composition.

The effective engagement of these disaffected pupils at Egerton High School through allowing them to direct their own learning, develop a high level of multi media ICT skills and develop their passion for music and verbal expression, led to early Expressive Arts GCSE examination entry and successful results for pupils aged 14 and above. It was this richly talented and artistic, yet challenging, group of young people that provided the opportunity to develop the DubDubDub project from a concept to reality.

The DubDubDub Genesis

DubDubDub was preceded by a number of other projects that have taken place at Egerton High School and Manchester Metropolitan University. These projects provide a useful insight into some of the main features of the DubDubDub work and will be briefly traced below.

Found Sound was a CDROM song-writing resource produced by the Virtual Learning Environments Foundation for Yamaha UK in 2003. It contained video clips and guidance notes for teachers. Part of the resource highlighted the processes that StatikSoundSystem, a Drum and Bass outfit based in Bristol, used to build their individual tracks into songs. They created starting points with sounds sourced from their travels locally and internationally, recorded them onto Minidisc and took them into the studio to edit, loop, develop and blend with beats. This process inspired pupils at Egerton High School. They sourced videos from the Internet of the natural environment. The incidental sounds that these videos contained were recorded through the computer's sound card as the video played. Pupils worked on the resulting files, collating, editing and processing them to form libraries of sound files. These sounds were sequenced with recordings of instruments or other samples to form compositions. The results ranged from videos of urban activities to videos of natural ambiances in isolated wilderness spaces. This type of study resulted in pupils becoming more aware of their own sonic environments. Subsequently, these have been recorded on their mobile phones and brought into school to convert and work with in a similar manner.

Parallel to this activity was an investigation of the sound design process through a trial of the UCan.tv resource - Sound2Picture (Savage 2005). This resource enabled pupils to develop their skills in the production of ambient loops, spot effects and other elements by experimenting with sounds and video clips. The resource contained a library of sounds and video clips and an interactive mixing environment for trying out combinations of sounds and visuals quickly and intuitively. Pupils used sounds they had created themselves rather than exclusively using the samples provided and examples of their work can be experienced at <http://www.sound2picture.net>. The process of completing a sound design to a video facilitated an improvement in the pupils' software skills, sound manipulation and sequencing. It promoted sound design as an accessible way of composing which was not dependent on playing traditional musical instruments. The classroom within which these projects took place contained no MIDI keyboards or traditional musical instruments. However, the headsets pupils used comprised of headphones and microphone and this led to some pupils generating

sounds with their voices and manipulated the waveforms to create new samples.

The third project at Egerton High School that helped fine tune the DubDubDub concept was part of a 'Super Learning Week' on Recycling in 2005. The timetable at the school was collapsed for a week and pupils worked in vertical groupings (i.e. with a mixture of pupils from each of Years' 7 to Year 11) looking at aspects of recycling across the curriculum. There was an interdisciplinary emphasis to activities. The Expressive Arts programme of study related the work that these artistically literate pupils had been doing to the concept of recycling by re-using audio from the Internet in a random and non-linear way to form compositions. Entitled 'Recycled Audio Portraits', the pupils were free to use the Internet as they wanted for an hour providing that they recorded all the incidental sounds that they discovered through the computers' sound card. Pupils were informed that the resulting sounds would be used to create an individual aural portrait of their Internet usage. For this reason, it was suggested that they place an emphasis on visiting bookmarked sites so as to present as broad a reflection of themselves as possible. A complimentary task involving recycling prose by cutting words out of poems and picking them out of a bag at random to form new syllabic expressions. Pasting words in new orders reinforced the recycling concept and pupils were encouraged to record their new verbal pieces on the computer and mix it into their Internet inspired audio portraits. Many initial recordings drawn from the Internet were edited to fit the length of the recorded vocal track. This provided a simple way of delineate the length of the piece. All the finished tracks were mixed together by a pupil as an extension task and the result was played as part of a series of performances on the Friday afternoon that celebrated the work done during 'Super Learning Week'. Critical studies during the week included an investigation of the Dada and Surrealist art movements, including art, games and films, and the cut-up technique used and developed by William S. Burroughs and others as popularised by David Bowie.

Finally, a couple of months prior to the commencement of the DubDubDub project, Urban Classic happened:

Urban Classic was a meeting of musical cultures that brought together some of the biggest names in UK black music with the BBC Concert Orchestra in a ground-breaking live event. (BBC 2007)

Urban Classic provided a relevant and contemporary context for the work that the pupils were about to engage in and led to a notable increase in their confidence. The collaborative elements of these pupils' work with postgraduate students from the Royal Northern College of Music (in the final stage of the DubDubDub project), and the experiences of working together within a diverse musical ensemble, were authenticated by the Grime scene approval and a BBC rubber stamp. Urban Classic was a timely, and very happy, coincidence for the DubDubDub project.

The DubDubDub Project

The aim of DubDubDub was to develop an intuitive performance instrument for pupils that would facilitate the control of Internet live audio and the recording and capture of it in real time. The initial presumption was that the interface would allow

for everything to be in one place. To this end, an interactive artist was employed to help design and make the software. The prototype was produced using Macromedia Flash. It allowed for Internet pages, along with embedded sounds, to be assigned to keys on the computer keyboard. As Figure 1 shows, each page could be opened or closed by pressing the appropriate key:

Insert Fig.1 about here: The Initial DubDubDub Interface

The prototype that resulted from these early experiments was similar to Soundplant (<http://soundplant.org>), an excellent piece of freeware within which one can attach sound samples from a computer hard disk to a computer keyboard. But Soundplant does not allow you to access the sounds contained within Internet pages.

Pupils at Egerton High School tried out the initial DubDubDub interface. During this trial they commented that they had no problems using a standard Internet browser to open several web pages at a time on their desktop or keep them tabbed on the taskbar. But this method highlighted some problems. Although it was easy to navigate the open web pages, it was not always easy to find out which page was playing which audio element. The way in which the DubDubDub interface should empower a user's engagement with Internet audio was of paramount importance. In this method, there was just too many mouse clicks getting in the way of creating mixes and performing with Internet audio.

During subsequent searches of the Internet for new browsers, a web browser was discovered that allowed for the tiling of pages within one page. The Avant Browser, (<http://www.avantbrowser.com/>) was free to download and proved to be fast, stable, customisable and easy-to-use. Its use removed the need for the creation of specific piece of DubDubDub software. Figure 2 shows eight web pages open in one Avant Browser page. Please notice that the eight open pages are eight different searches from the Google Video site:

Insert Fig. 2 about here: The Avant Browser

A very useful performance application of the Avant Browser facilitated the collection and storage of sets of favourite pages, enabling the user to return to them quickly in a live performance setting. The browser also facilitated the mixing of sounds as each 'tile' of a web page has controls for volume and looping its sonic content.

A second piece of software was combined with the Avant Browser for the DubDubDub project. Google Video (<http://video.google.co.uk/>) is a dedicated video search engine that is content safe to use with pupils.

Insert Fig. 3 about here: The Google Video Main Page

Figure 3 shows an open Google video on one Internet page. It is important to note the controls at the bottom of the page. These include a pause/play button, a time line cursor to locate or repeat sounds and a volume control slider. By downloading the Google Video Player rather than just playing back videos within the Google video homepage, pupils were able to use these controls to facilitate a greater degree of versatility in terms of managing audio (as well as providing an enhanced quality of

video playback). Figure 4 shows six videos open at once within the Avant Browser, each with controls accessible and a thumbnail of the selected video playing:

Insert Fig. 4 about here: Multiple Google Videos in the Avant Browser

The combination of Google Video within the Avant Browser effectively provided pupils with a sound-mixing environment. The sonic environment of the Internet or specifically, in this case, the sounds attached to videos uploaded to Google video, are manipulated and controlled by the DubDubDub player which is, itself, a conflation of existing technologies.

Audio exists on the Internet for a variety of reasons and serves a number of functions. It may arise incidentally by way of an embellishment to a corporate website or it may have a specific function such as a radio station. Sounds of the natural environment exist on the Internet and it is certainly easier to discover the sounds of a tropical rain forest on the Internet than organising the recording of these on location! There is a vast array of other sounds attached to web pages, many of which can be triggered through the control of a mouse. This interaction with a web site can become part of the audio mix, e.g. the controlled output through clicking and triggering sounds with a mouse can feature alongside various embedded sounds that exist within the webpage.

The DubDubDub player worked on the principle that these sounds will resonate together and that it is the user's skill, practice and sensibilities towards these sounds and processes that produce effective improvisations. This type of musical skill or understanding is not dissimilar to the sensibilities needed in a range of other musical activities with which pupils were familiar. Firstly, by learning to play vinyl decks, CD turntables or PCs as instruments pupils were able to develop a range of skills which transferred well to the DubDubDub project.

As well as the DJing techniques that pupils were familiar with, spitting (free styling bars, rhymes and phrasing) over a spacious grime beat, typically around 135 beats per minute, also harnessed the sensitivity, the listening and the responding skills needed for effective DubDubDub use. For pupils, it was a natural progression to use these DJing and spitting techniques when using DubDubDub.

At this stage, the DubDubDub player was a facility comprising of a conflation of web technologies and a taught sensibility, a real time interactive tool and concept. The final element was a straightforward way to capture the player's decisions and record the outcomes for further use, analysis or editing. This tool became the UCan.tv sound recorder. It provided a way to record any audio that was passing through the computer's sound card without having to change any computer audio settings (as you would have to do with a piece of freeware such as Audacity). Sound captured by the recorder can be edited and uploaded to a sequencer for future use. The UCan.tv sound recorder was the final part of the DubDubDub player.

The First DubDubDub Performance

Prior to the first performance with DubDubDub, a number of extended teaching sessions were held at Egerton High School. These included a number of students from

the Manchester Metropolitan University's PGCE in Music with Specialist Strings Teaching course (taught in collaboration with the Royal Northern College of Music). These students worked with the school pupils to develop their skills with the DubDubDub player. During these sessions, the MCs and DJs had shared their enthusiasm for music, demonstrated their skills and discussed ideas for the performance with the university students. There were many interesting conversations between the pupils and the students during these sessions. Figure 5 illustrates well some of these interactions.

Insert Fig. 5 about here: Sharing Ideas Prior to the DubDubDub Performance

As a new type of instrument, the musical material generated via DubDubDub can be combined with other instruments in a performance setting. It can sit with any existing style or genre of music, and this is what the authors aimed to illustrate during a performance at the Discourse, Power and Resistance conference hosted by the University of Plymouth and Manchester Metropolitan University on the 21st April 2006.

For the performance, the DubDubDub player was combined with a string quartet (formed by the PGCE students) and some MC's and DJ's from an extended school's project being held at Egerton High School. Figure 6 shows the performance group.

Insert Fig. 6 about here: The DubDubDub Performance at the DPR Conference

More pictures from the performance, a link to a video of the performance and other resources can be found at <http://www.dub3.tv>

The performance moved through three sections. The string quartet opened with a traditional performance of Pachelbel's *Canon*. During the second stage of the performance, this was deconstructed as students moved away from their string instruments, one at a time, to add sounds and music using the DubDubDub interface on four, Internet-enabled laptop computers. The resulting mix of sounds from the Internet formed the middle section of the performance. One student searched for Google videos of violinists performing the same opening piece and this provided a simple conceptual link to the first section of the performance. The nature of the DubDubDub player means that each performance is uniquely different because the content relies on *live* internet, in this case complete with its quirky connection status. The final movement of the performance involved the MC's and DJ's from Egerton High School and the extended school's project. They introduced and blended in some contemporary grime beats using an MP3 player, a CD deck and a cross-fade mixer. Quite naturally they started spitting lyrics over the resulting sounds. Through these lyrics they introduced themselves, who they were reppin (representing) and established their style. Much of this was freestyling (a kind of vocal improvisation) combined with the inclusion of existing bars (sections of lyrics) that they had written to suit the occasion. During this final stage of the performance the string quartet/DubDubDub players gradually moved back to their string instruments from the laptops and improvised with the MC's and DJ's. At the end of the performance all performers were contributing to the piece. The string players were improvising with the MC's and DJ's using the wider sonics and harmonics of their instruments to compliment the grime beats through emulating scratch sounds, sub-bass riffs, bass

drum grooves and claps. The original Baroque piece had been transformed through a DubDubDub-inspired breakdown into a unique presentation of improvised music and expression.

Analysis of the DubDubDub Project

The performance was well received. Afterwards, the audience (mainly consisting of academics and researchers) had the opportunity to direct questions at any of the team. These included questions about the processes and outcomes and significant interest in the delivery from the MC's and DJ's. Several questions focused on the links between improvisation and freestyling. Here, the authors have drawn a range of conclusions from these questions and answers that have helped inform their own judgements about the DubDubDub project.

1. Artistic processes were central to DubDubDub

Fundamentally, indeterminate art is concerned with artistic process. The DubDubDub project engaged students and pupils in an indeterminate process of musical performance, albeit with a range of pre-established reference points that informed their decision-making process (e.g. bookmarks of Internet sites, pre-written lyrical content and musical beats, etc). We were pleased to note that both groups of young people were not afraid to explore the improvisational process as an integral element of the musical performance. More widely, many of them were able to incorporate ideas about improvisatory practices drawn from a range of other work that they had recently completed. For the students from the Manchester Metropolitan University, this included elements of improvisation pedagogy drawn from their Dalcroze studies, particularly principles from eurhythmics classes. For the Egerton High School pupils, the projects discussed above placed the DubDubDub project in a wider context of multimedia work centred around preparations for a GCSE in Expressive Arts (which pupils undertake in Year 9).

2. Music and the visual image

During the DubDubDub performance the visual output from each of the four laptop screens was mixed and displayed for the audience on a large screen. Figure 7 shows how screen allowed the audience the opportunity to see how the DubDubDub player was being used in real time:

Insert Fig. 7 about here: The Visual Dimension of DubDubDub

Although music was the main focus of the DubDubDub performance, having a screen that presented the decisions about which websites the DubDubDub players decided to visit created some transparency for the audience and demystified the sources of sounds. In Buxton's terms (Buxton 2005, p.5) it provided the audience with a visible side to musical cause and effect. Through discussion after the performance, it was apparent that it enriched the audience's appreciation of the skills and control of the sounds that the players were manipulating. This is equivalent to watching a string player's physical manipulation of their instrument. Using the DubDubDub player is, by nature, an audio and visual experience. It allows the user to cut up culture, re-

arrange and subvert images, video and sounds live from the Internet to create new and unique audio or visual ‘instances’. Whether the user is dealing with sonic or visual elements, or both, the DubDubDub player facilitated artistic expression through the sonic and visual environment of the Internet, honing an appreciation of the role of chance in musical performance.

3. Democratising performance skills

The DubDubDub player can be used by anyone as long as they have access to a computer, an Internet connection and some speakers or headphones. All actions are triggered through a traditional mouse and QWERTY keyboard. The skills needed to perform with DubDubDub are similar to those generic musical skills that all improvising musicians should have, i.e. the ability to listen, to respond, to select and modify, to take the lead on occasions or sit back, to work collaboratively or with a degree of independence, etc. The interface of the DubDubDub instrument is familiar and deliberately simple. As such, it is easily accessible and allows the user to get involved in the process of musical performance easily. Within the educational context, a networked computer suite is an ideal platform for a DubDubDub performance. From any internet enabled computer, a pupil is able to apply their natural ability to create creating music by finding sounds attached to web pages, manage, mix and record them to form compositions and document their processes using screen capture tools. As the DubDubDub performance demonstrated, music created in this way sits alongside traditional musical instruments very comfortably.

4. Musical collages and the immediacy of artistic expression

DubDubDub allows users to combine the sounds attached to various Internet sites in a way that creates very powerful musical collages. Clear comparisons can be made to a number contemporary works, e.g. John Cage’s *Roaratorio*. This work, constructed by Cage in 1979, would be an excellent resource to illustrate the range of musical outcomes one could construct through the interface between traditional instruments and new technologies. Consisting of three main elements, *Roaratorio* combines a narrated poem with traditional Irish musicians and over 4000 different recorded sounds on tape. It is important to remember that Cage produced *Roaratorio* without the benefits of modern sampling techniques. His statement that ‘I never imagine anything until I experience it’ is hugely relevant in this context (Cage 2007). It is this sensibility to the spontaneous and immediate working with sound that was central to the DubDubDub performance. It was pleasing to note that this concept, complete with its technological, visual and musical dimensions, promoted the musical understanding and appreciation of two very diverse groups of young people. Not only that, but it brought them together to share a common musical discourse which, we believe, it would have been hard to imagine through any other means.

Conclusion

We [the NIME community] are in a unique position to raise the bar as to the quality and range of experiences, devices, and the expressive capabilities they inspire, particularly as it relates to music creation and education. (Blaine 2005, p.32)

As we discussed in the introduction to this paper, contemporary musicians and artists are exploring the potential of new technologies as musical performance tools. In what is a very gradual, but well documented, process, these new technologies are beginning to be applied and explored within educational contexts in the United Kingdom (Savage 2005b, Savage 2007). This is not without its difficulties. Many teachers are inherently conservative in their views and reluctant to embrace change:

Many music teachers are reluctant to use ICT extensively in their teaching. It may be for a number of reasons: lack of confidence in their own ICT capabilities; fear that their students know more than they do; lack of awareness of the potential benefits of using ICT; concerns that technology-based music may take over from more traditional approaches. (Ashworth 2006, p.3)

Blaine’s encouragement (2005, p.32) to us is to reconceptualise the notion of a musical instrument for the 21st century. Associated with this change in mindset, is the opportunity to reanalyse the process of musical performance and improvisation. There is an opportunity to get beyond the stereotypical notions of technique, interpretation and recreation as being central to instrumental performance and use new, technological innovations in such a way as to support the development of generic, accessible and intuitive musical performance skills. To do this, Blaine emphasises that designers of these new instruments will need to consider a range of issues, including:

- How gestures can be mapped to musical outputs;
- Creating more expressive controllers;
- Integrating multiple combinations of sensors;
- Developing musical learning systems alongside new instruments;
- Adding levels of engagement with new musical instruments that lead to expert performance (Blaine 2005, p.32)

DubDubDub is an example of some of these processes (although the concept of a linear progression of instrumental use from beginner to expert performer seems overtly simplistic). It falls within what Bowers and Archer (2005, p.6) have called an ‘infra-instrument’. In their useful summary of meta-, hyper- and cyber-instruments a number of themes are identified which richly contrast with their notion of an ‘infra-instrument’:

Meta, Hyper & Cyber-instruments	Infra-Instruments
Rich interactive capability	Constrained interactive repertoire
Detailed performance measurement	Few sensors or few gestural measurements
Engendering complex music	Engender relatively simple music
Expressivity and virtuosity	Restricted in terms of virtuosity and expressivity

(after Bowers & Archer 2005, p.6)

Despite these apparent reversals of instrument design, they argue that infra-instruments are nonetheless ‘aesthetically engaging and technically intriguing’ (Bowers & Archer 2005, p.6) and worthy of further study, which they go on to do in

some detail. Their findings have some relevance to our discussion here, particularly that infra-instruments are evaluated best within the context of a 'performance setting':

Handling an assembly of stuff is often facilitated by an infra-instrument designing philosophy, where each device plays its part in a manageable hybrid environment. ... The whole performance setting becomes the unit of analysis, design and evaluation, not just a single 'new interface for musical expression' (Bowers & Archer 2005, p.6).

This reflects a recent theme in Bower's work, that of 'performance ecology'. This has a rich resonance for those involved in formal, classroom-based music education. By 'performance ecology', Bowers means a closer analysis of the places for practical action and its display to others (performers or audience). Examples include desktop performance ecologies (or even classroom performance ecologies) that may:

- Be differentiated (a place for the computational, for the acoustical and for other tools);
- Be integrated in a variety of ways;
- Allow opportunities for juxtapositions and for legible, embodied conduct (how performers look for, reach for, touch, communicate in non-verbal ways, etc).

This notion of a 'performance ecology' reminds us that all musical interactions are contextualised. Regardless of whether they are technological in the digital sense, traditional in the musical sense, or a juxtaposition of the two, musical interactions between young people need to be understood in the context of a wider performance ecology. DubDubDub presented a new mode of artistic expression to a group of postgraduate students and school pupils. In many senses it is characterised by infra-instrument design: it was based on few gestural movements; it was constrained in terms of operability; it was deliberately simple to use and based on pre-existent web-based technologies. Did it produce or engender simple music? That is a judgement to be made by the listener. Readers of this paper can make their own judgement by viewing and listening to the performance hosted on Google Video (UCan.tv 2007). Either way, DubDubDub may be one tool that the contemporary music educator development can use to help develop young people's musical performance and improvisation skills.

References

- Ashworth, D. (2007) *Electrifying Music: A guide to using ICT in music education*. London, Paul Hamlyn Foundation.
- BBC (2007) <http://www.bbc.co.uk/1extra/events/urbanclassic/features/event.shtml> [accessed 2/7/07].
- Blaine, T. (2005) 'The Convergence of Alternate Controllers and Musical Interfaces in Interactive Entertainment'. Proceedings of the 2005 International Conference on New Interfaces for Music Expression. Canada, Vancouver, BC.
- Bowers, J. (2003) *Improvising Machines*. Advanced Research in Aesthetics in the Digital Arts, No.4. <http://www.ariada.uea.ac.uk/ariadatexts/ariada4/> [accessed 10/7/07].
- Bowers, J. & Archer, P. (2005) 'Not Hyper, Not Meta, Not Cyber but Infra-Instruments'. Proceedings of the 2005 International Conference on New Interfaces for Music Expression. Canada, Vancouver, BC.
- Buxton, B. (2005) 'Causality and Striking the Right Note'. Proceedings of the 2005 International Conference on New Interfaces for Music Expression. Canada, Vancouver, BC.
- Cage, J. (2007) Roaratorio: An Irish Circus on Finnegans Wake, for voice, tape & Irish musicians. <http://www.answers.com/topic/roaratorio-an-irish-circus-on-finnegans-wake-for-voice-tape-irish-musicians?cat=entertainment> [accessed 4/7/07].
- Oore, S. (2005) 'Learning Advanced Skills on New Instruments'. Proceedings of the 2005 International Conference on New Interfaces for Music Expression. Canada, Vancouver, BC.
- Savage, J. (2002) 'Electroacoustic Composition: Practical models of composition with new technologies', *Journal of the Sonic Arts Network*, 14, pp8-13.
- Savage, J (2003) 'Informal Approaches to the Development of Young People's Composition Skills' *Music Education Research* 5:1, pp 81-85.
- Savage, J (2005a) Developing Compositional Pedagogies from the Sound Designer's World *Music Education Research* 7:3 pp 331-348
- Savage, J (2005b) Working Towards a Theory for Music Technologies in the Classroom: how pupils engage with and organise sounds with new technologies *British Journal of Music Education* 22:2 pp 167-180.
- Savage, J (2007) Reconstructing Music Education through ICT *Research in Education*.
- Soundbeam (2007) <http://www.soundbeam.co.uk/> [accessed 4/7/07].

UCan.tv (2006) *DubDubDub Performance*.

<http://video.google.co.uk/videoplay?docid=2356848748259785982&q=dubdubdub&total=4&start=0&num=10&so=0&type=search&plindex=0> [accessed 7/7/07].