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***Sound2Picture*: developing compositional pedagogies from the sound designer's world**

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Sound2Picture (www.sound2picture.net) is the latest stage in a series of research and development projects being conducted at Manchester Metropolitan University (MMU). It documents the work of one sound designer who demonstrated a host of new skills and imaginative practices with hardware and software. The article shares aspects of this work through case study and considers the implications for the work of music educators.

Introduction

In the work of many contemporary artists, the use of new technologies re-situates musical practices within the world of the digital arts. Sound designers are one such group of artists who work regularly with digital sound, image and video material. *Sound2Picture* is the latest stage in a series of research and development projects being conducted at Manchester Metropolitan University (MMU). These began with an investigation into the songwriting practices of popular music composers (Savage, 2003). Through the research dimension of this songwriting project, collaboration between MMU and Alchemy Audio Lab, a company of sound designers led by sound designer Andrew Diey, was established. The *Sound2Picture* CDROM was the first product of this collaboration (www.sound2picture.net).

Alongside the production of this CDROM of teaching resources, MMU researchers conducted a parallel investigation into the sound design process. The aim of the *Sound2Picture* research was to illustrate how the processes and practices of sound design, i.e. creating, classifying, editing and mixing sounds to picture, could extend existing school-based compositional pedagogies.

The teaching of musical composition is well established in classrooms throughout the UK. As an integral part of the national curriculum, teachers are required to teach their pupils compositional styles and techniques, allowing them opportunities to 'create musical patterns, explore, choose and organise sounds and musical ideas'

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from the age of 5 and ‘improvise, exploring and developing musical ideas when performing; producing, developing and extending musical ideas; selecting and combining resources within musical structures and given genres, styles and traditions’ from the age of 11. There is also a clear expectation that from the age of 8 pupils will ‘use information and communication technologies to capture, change and combine sounds’ as part of their music teaching (DfEE, 1999).

But the Qualification and Curriculum Authority’s (QCA) recent consultation (Futures—Meeting the Challenge) has many interesting additional points of departure for arts educators. Not least, is the challenge to explore and utilise the potential of new technologies to link subject areas within the curriculum in new ways:

In a technology-rich world we need to review and modernise what and how we learn. Imagine how a graphic designer works today compared with 30 years ago. What should a modernised music, art or design curriculum be like? . . . They may use technology as a tool for thinking, making or doing. Technology needs to be used more effectively to help develop learners’ enquiry skills, logical reasoning, analytical thinking and creativity. It should support individualised and independent learning, while encouraging wider communication and collaborative learning. (QCA, 2005)

The QCA, and the Government more widely, view the use of technology as a ‘force for change’ in developing a school curriculum fit for the 21st century. Our concern is that without significant intervention from leading educators, new technologies will continue to reinforce traditional subject content rather than open up exciting, new technologically rich and cross-disciplinary artistic practice. It is clear from recent QCA statements that such ‘joined-up’ thinking should be an increasing priority in any new curriculum developments.

Similarly, Eisner’s challenge to art educators confronts those within the music education community with equal relevance and force:

The development of computer technology has suggested to many that the computer can become a technology of unparalleled importance in the arts. What does such a vision imply for the creation of school programs in the arts? What does a computer allow students to do with images that other technologies don’t, and what might such a resource mean for the development of cognitive skills? (Eisner, 2002, p. 41)

Important decisions will need to be made about the future purpose and practice of music education in light of this technological revolution. But for many the focus has been elsewhere:

For many schools the main focus of activity following installation of networked ICT infrastructure was on teaching ICT skills. Cross-curricular use of ICT is difficult for secondary schools to achieve because ICT has traditionally been a specialist subject for GCSE. *A major shift in culture and established practice is involved in the introduction of ICT within subject teaching.* [My italics] (DfES, 2002, p. 19)

There is a strong argument for teachers to respond to the natural pull of digital technologies towards the arts (Sefton-Green, 1999) and to make links across the curriculum. Sound design contains a rich history of collaboration between the

various members of the film studio, but there is a much longer history of collaboration between visual artists and composers that clearly shows the interdependence of both art forms in terms of final products and, more importantly, the artistic process

Previous research had considered the compositional processes of electroacoustic composers (Savage & Challis, 2001, 2002). It was apparent that digital technologies presented the composers with the opportunity to handle digital sonic or visual materials with a range of common processes. In applying these ideas to the classroom context, pupils were able to use computers to select, manipulate and structure audio and video materials in common ways through similar software and by thinking about related artistic principles (Savage, 2004). *Sound2Picture* is another attempt to encourage teachers towards cross-disciplinary work of this type.

What is sound design?

Sound designers guide the sound of a motion picture from beginning to end, interpreting the director's expressions, 'hearing' the script and storyboards, coordinating with the composer and sound editor, contributing to the mixing process, even ensuring that what is heard in the theatre is of optimum quality. (Mancini, in Weis & Belton, 1985, p. 361)

Mancini's description of the sound designer's role is a good starting definition. As the amount of visual information contained with movies has increased, so audiences must experience correspondingly detailed and heightened sound effects in order to perceive these images and sense them as realistic. The soundtrack of a movie (containing the musical score and sound effects) is therefore every bit as important as the visual element. As Thom points out:

You may assume that sound design is about fabricating neat sound effects. But that doesn't describe very accurately what Ben Burt and Walter Murch, who invented the term, did on *Star Wars* and *Apocalypse Now* respectively. On those films they found themselves working with directors who were not just looking for powerful sound effects to attach to a structure that was already in place. By experimenting with sound, playing with sound (and not just sound effects, but music and dialog as well) what they found is *that sound began to shape the picture sometimes as much as the picture shaped the sound*. The result was very different from anything we had heard before. The films are legends, and their soundtracks changed forever the way we think about film sound. [My italics] (Thom, 1999, p. 1)

The educational potential of sound design

Sound design is attracting increasing attention primarily due to great sound design in movies, computer games and television. But the increasing availability of computer hardware and software has meant that what was previously the domain and practice of the professional studio composer can now be accessed by anyone possessing a modestly equipped personal computer and access to the Internet.

There were two main reasons for considering the work of sound designers as a way of informing a cross-disciplinary model of composition in high schools. First, the relationship between music and the visual image are long established in artistic practice. Secondly, the role of digital technologies within schools has become increasingly pervasive (Somekh, 2000; Selwyn, 2002). As Cain points out, the incorporation of these technologies into schools has resulted in considerable changes ... 'and, what is perhaps even more important, they have brought into question some of the most basic conceptual frameworks that have underpinned music teaching' (Cain, 2004, p. 217).

A brief historical framework

Composers and painters alike have frequently gleaned new ideas from an approximation to, or borrowings from, procedures used in the sibling art. This reciprocal relationship runs like a continuous thread through the entire [twentieth] century. (Maur, 1999, p. 8)

This quotation illustrates the close relationships between artists and composers in recent Western history. Perhaps one of the most famous and obvious examples of a painter considering musical themes is Paul Klee, for whom music 'was the one discipline of art above all others that inspired profound insight' and showed him 'the innermost essence of nature, not a reproduction of it' (Düchting, 2002, p. 88). Throughout the entire 20th century, the symbiotic artistic processes and conversations between visual artists and composers are apparent for all to see (and hear). The philosophical and religious beliefs about the interdependence of sound and colour through composition and writing are well established:

There are no dividing walls between the arts. Music combines within itself poetry and painting and has its own architecture. (Ciurlionis, 1998, p. 53)

Colour is the key, the eye is the hammer, the soul is the piano with its many strings. (Kandinsky, 1947, p. 64)

Maur argued for 'the sound of painting', and in *Sound2Picture* sound design was conceived as 'the painting of sound'. Sound designers talked about their work with sounds through the use of visual metaphors, e.g. the brush strokes of compositional style:

I feel that sound design is an area in which you can either paint with very large strokes or very fine strokes. You can go as deep as you like and put as much detail in as required. Or you can just paint with broad strokes. (Andrew Diey, in interview, 2004)

or the relationship between the choice of sounds and particular colours:

The overall feel and colour of the movie is washed out colours, lots of blues and dark sort of deep browns and things like that. So it automatically suggests a sort of cold feel to the actual sound itself. There's not much warmth in the colour so I have to reflect that in my choice of sound. (Andrew Diey, in interview, 2004)

The artistic potential of new technologies

Recent research has shown the interdependence of artistic work when new technologies are incorporated within the classroom environment (Savage & Challis, 2001, 2002). One of the main themes within the research was the interplay between aural and visual work, in particular that each associated 'discipline' reinforced the thinking, creative ideas, potential and understanding of the other.

Sound design offered the potential to facilitate more of this cross-disciplinary interchange within the 'seductive meeting point' of new technologies (Waters, 1994, p. 28). Conceptually, this required a redefinition of music as a 'subject culture' (Selwyn, 1999) and its associated working practices, as well as a consideration of how these related to other parts of the curriculum. Francis Dhomont, the classical French electroacoustic music composer, summed it up like this: 'We have more in common with the filmmaker or the sculptor, the painter, with the plastic artist, than with the traditional musician. I really have that feeling, even though my origins are in traditional music' (Dhomont, 2002).

Recent research evidence has noted that it is a worthy goal to integrate new technologies with subject learning (DfES, 2002, p. 3). Sound design offered an exploration of exciting new notions of artistic practice that integrate rich mixes of subject learning with new technologies. It was hypothesised that this could help develop music education towards a holistic model of artistic practice mediated through the effective use of new technology.

The research methodology

The aim of the research was to illustrate how the processes and practices of sound design could extend existing compositional pedagogies. The methodology chosen was qualitative in design and used case study. It focussed on the work of one particular sound designer whose approach to sound design seemed particularly interesting. He was also selected because of his ability to talk coherently about his musical products and describe, often in great detail, the working process he adopted. Case study of this type has a long tradition within the UK's educational system, including Treacher (1989, 1992) who used action research and case study to produce curriculum specifications and materials. A more recent adaptation of this approach has been used by Sefton-Green in his survey of the digital arts (1999).

Within case study research, there are several main styles. Stenhouse (1988, p. 49) identified four principle types of which this research can best be categorised as ethnographic case study, defined as a single in-depth case investigated primarily by participant observation supported by interview and analysis of other documentary materials.

Participant observation and interviewing

Close and thoughtful observation of others is always an important and intensive feature of participant observation, and this includes, as an important element, observation of speech in natural settings. (Stenhouse, 1988, p. 51)

During the research, a number of formal observations of Andrew's work were made whilst he composed sound designs for six short movies (see appendix for a brief description of each movie; a selection of work done by school pupils with these movies can be viewed at www.sound2picture.net). These observations were videotaped and, on occasions, involved Andrew giving a 'commentary' of his working process. In addition, Andrew kept detailed notes of his working process and a selection of screenshots from his computer to illustrate the various stages of each composition's development. At the conclusion of the project, Andrew was interviewed about his work. The transcript of this interview contained much valuable information and can be read in full at the project website. The data drawn from this interview and observations were collated and analysed using basic principles drawn from grounded theory (Glaser, 1999).

The collection and analysis of other documentary materials, including photographs, video and music

The multimedia nature of the case study meant that many other materials were developed throughout the project. Musical outcomes were particularly significant as were photographs and video of Andrew's work. Many of these materials found their way into the final CDROM of teaching materials but also proved very interesting from the research perspective.

Finally, the organisation of all the materials generated by a case study is a crucial part of the process of analysis and needs to be managed effectively. The case record generated by the *Sound2Picture* research was large and needed to be handled in such a way that key concepts and ideas were not lost. Given the multimedia dimension of the case study, Walker's notion of representation and presentation was particularly significant (Walker, 2002, p. 117). Drawing on the work of Stenhouse (1978, p. 37), Walker differentiates the process of representation, by which he means the way in which data is represented for use by researchers, to presentation, which is the 'data organised in order to present to a reader an interpretation of its significance in relation to some topic, issue or problem' (Walker, 2002, p. 117).

It is under this notion of presentation that this article will present selected findings from the represented data that constituted the *Sound2Picture* case study. These findings will be considered within a description of the working process that Dey followed throughout the *Sound2Picture* research.

Table 1. The sound design process

Step 1	Thinking in pictures
Step 2	Choosing the colour palette
Step 3	The source: choosing the overall sounds
Step 4	The visual cue: choosing specific sounds
Step 5	Additional elements
Step 6	The final mix

A sound design process

Diey provided detailed notes describing how he approached each of the six movies within the project. These notes provided a fascinating insight into how he worked as a sound designer. The process of work in each movie was slightly different but common themes emerged. Table 1 outlines the main steps as Diey identified them.

Other recent research has identified a clear process of composition drawn from observations of the work of postgraduate composers at the University of East Anglia (Savage & Challis, 2001, 2002). This compositional process was used to underpin the work in two major case studies of pupils’ work with digital technologies and can be illustrated as in Figure 1.

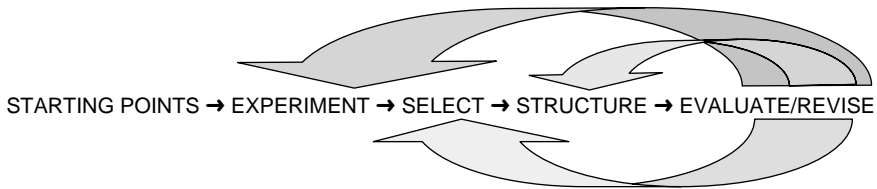


Figure 1. Composition process drawn from the work of electroacoustic composers

A combination of these two models gives the process in Table 2.

Table 2. A combined compositional process

Step 1	Thinking in pictures	STARTING POINTS
Step 2	Choosing the colour palette	
Step 3	The source: choosing the overall sounds	EXPERIMENT–SELECT
Step 4	The visual cue: choosing specific sounds	
Step 5	Additional elements	
Step 6	The final mix	STRUCTURE
EVALUATE/REVISE (return to any of the previous steps)		

Step 1: STARTING POINT ‘Thinking in pictures’

A key feature of Diey’s work was his ability to ‘think in pictures’. During interview, he explored the potential of the moving image as a source for inspiration in his sound

design. What did ‘thinking in pictures’ mean? For Diey, it came down to two main things.

(i) *Environmental Issues.* Firstly, Diey asked key questions about the environmental perspectives that are played out within the movies. He considered how these perspectives were defined and what they might mean. Sometimes the environmental perspective was clearly defined as in the *Citydrive* movie:

So within the actual perspective if you look at the physical location of the sounds that are required you’re sitting in a traveling automobile so you are already defined within the borders of your acoustic environment. (Andrew Diey, in interview, 2004)

In this example the physical environment was fairly fixed and this led to an unproblematic assumption as to which elements of the acoustic environment would need to be considered within the sound design:

And so straightaway you can start to break down the elements of what you will immediately hear . . . (Andrew Diey, in interview, 2004)

But what about when things were not quite so obvious from a physical environmental perspective? The *Graphix* movie was very different from the other movies in this respect. It contained a series of very colourful but mostly abstract images. This presented a different dilemma:

It’s kind of hard to nail down exactly what the pictures will sort of say from a sound perspective because there is no real visual hook other than the key elements that are on these, such as motion, colour and movement. (Andrew Diey, in interview, 2004)

In the absence of a direct physical environment, other elements came into play. These were not always related to the visual image but included musical forms and devices, a point discussed below.

The consideration of a movie’s environmental perspective led Diey to make a series of choices that affected all the subsequent steps of the sound design process. In looking for inspiration from the environment presented in a sequence of film, he had to consider certain fundamental questions such as:

- How had the physical environment been defined?
- Were there aspects of the suggested physical environment that gave clues as to the possible accompanying acoustic environment that he was going to create?
- Should the sound design embrace or ignore, restrict or extend the possible acoustic environments suggested by the pictures?
- Could the visual environment be transformed through a new approach to the acoustic environment that would be created?

As with each step of the sound design process, Diey made creative choices here. These choices had important consequences for the final shape of the sound design. But it is important to emphasise that he did not see these as right or wrong responses. There were multiple interpretations of the environmental features of any given movie

and, as the two versions of the sound designs for the *Butterfly* movie demonstrated beautifully, the end results were very different.

(ii) *Interrogating and exploring the visual image.* The second main feature of ‘thinking in pictures’ was the direct and detailed interrogation and exploration of the visual image. There were numerous examples of this within each of the six movies. The critical point is that key visual elements or cues inspired a response from the sound designer:

The *Nature Technology* movie itself is really quite stark. The feel of the sounds within the piece are two fold. You have the small, discrete sounds of nature and then you have the big bold sounds of the radio telescope that have an almost cold war feel about them. The way that the movie is shot is eerie and almost with a sense of suspense to it so the sounds that I chose initially were big, underlying, slow moving, discordant chords which then evolve into another discordant chord. (Andrew Diey, in interview, 2004)

At a certain level, there was a basic following of the visual events of the movie (drawn from this interpretation of the visual image). But at a deeper level Diey considered the elemental features of images as a source for inspiration. This became particularly important when the images on screen were more abstract. Once again, the *Graphicx* movie gave the best demonstration of this:

The graphics themselves are full of colour, motion and depth. There’s not really much to be said about the meaning behind the visuals. So when you get a piece of abstract visuals, it’s often best to rely on musical form to carry the mood forward. So the choices that I made for this piece of graphics was to put a music backing track and try to latch on some of the motion that is actually in the movie itself, whether it’s a piece of graphics that is actually shooting past the screen, whether it’s a slow moving piece of graphics. (Andrew Diey, in interview, 2004)

Diey linked the abstract nature of the visuals with the familiarity of musical form in order to carry the mood of the movie forward. What could be described as Diey’s compensatory approach to the movie allowed him to imbue abstract visuals with a musical sense of motion and progression that carried them to a point beyond that which could have been reached independently of the sound design. It was a good example of abstract visual elements affecting music choices, which, in turn, led to the embracing of musical opportunities.

Step 2: STARTING POINT ‘Choosing your colour palette’

One of the most important assets of a sound designer is their sample library:

Categorisation of sounds is primarily a personal and subjective way of collecting and organising sounds. One of the most important parts of being a working sound designer on a day-to-day basis is the ability to know your sound library. (Andrew Diey, in interview, 2004)

Diey’s sound library is a personal collection of over 1½ terabytes of original sounds that have been recorded and collected over many years. Such a massive

amount of material requires careful classification and archiving. Diey saved valuable time by being able to place his hands (and ears) on a particular sound file quickly and easily.

Diey's first skill was being able to classify sounds into various colour palettes that might relate to his particular thoughts about the visual images contained within a movie.

The order in which my sounds are categorised are often into types of sound whether they're nature, machines, abstract, electronic, synthetic, musically applied sound effects or acoustically recorded sound effects. (Andrew Diey, in interview, 2004)

But things were slightly more complicated than just choosing one category for a specific sound:

If I take, for example, the sound of a gong, a huge 20-inch gong, it can be recorded in many different ways such as contact recording or air-born recording. The usage of that gong is quite diverse. You can take the sound of the gong and put it into a musical frame. But you can use it such as the *Nature Technology* movie at the end, where I EQ-ed filtered sounds to give the sound of punctuation. (Andrew Diey, in interview, 2004)

So Diey's second skill in choosing a colour palette is in realising the diverse potential of sounds, even those that may not be the initial and most obvious choice. Sound designers have an acute sense of their sound environment and the potential of sounds that many of us might consider insignificant as musical material. Developing this interest in sound is a vital skill:

Sound design is very much a case of being aware of what is around you in your environment. Any sound designer who works professionally will tell you that the most important tool for a sound designer is their ears. Secondly you have your auxiliary ears known as your microphones. And thirdly you have the recording device which is the DAT machine, tape machine or Minidisc. You must learn to pay attention to what sounds are around you. (Andrew Diey, in interview, 2004)

Step 3: EXPERIMENT–SELECT 'The source: choosing your overall sounds'

For Diey, as with any composer, the whole composition process is about exploratory play. Our observation of Diey's work suggested that within this approach there were various discrete steps or stages of work. But it is important to remember that every step was characterised by making choices and that these choices had consequences.

When asking Diey about the particular sounds that he had chosen for each movie it soon became apparent that he thought about the layers of sound within each sound design. From this we decided to conceptualise his choices against the categories of 'overall sounds' and 'specific sounds'. The concepts are self-explanatory but they facilitated a detailed consideration of how and why particular sounds were chosen for each composition.

As an example, Diey's comments on the *Butterfly* movie were particularly informative:

If we look at the sounds as two or three layers you have the foreground which is the sound of the butterfly itself as it moves around the screen. And then you have the background sounds of the daytime and what that might mean in this garden region. The background sounds that I chose to put in were a couple of layers including the sounds of wind, traffic passing and, most importantly, the sounds of children playing in the background. (Andrew Diey, in interview, 2004)

For Diey, one particular background sound had particular significance—the sound of children playing with butterflies. This took him right back to his childhood and his frequent visits to a butterfly farm.

When I was younger I visited a butterfly farm just on the outskirts of Edinburgh. It was in this enormous heated cocoon and there were hundreds of butterflies from exotic ones to the more common Red Admiral and things like that. I always liked it because of the colour and the way that these creatures moved. (Andrew Diey, in interview, 2004)

However, its inclusion developed an important point for any sound designer—the pre-eminence of one's own personal life experience as a key factor in the composition process. To demonstrate this point, Diey completed two distinct sound designs for the *Butterfly* movie. One is a reflection on his childhood and the other reflects on his wider work in music over the past 15 years.

My experiences have been very much involved in dance music, electronic music, having record shops, being on radio shows and working on a daily basis as a professional composer. I decided to put lots of energy and musical energy within the actual butterfly movement themselves and the choices that I made were to put beats underneath and carry the movement forward. (Andrew Diey, in interview, 2004)

Overall sounds, whether they are the sound of children playing or contemporary beats, have a vital role to play in the sound design. They act as a 'sound bed' against which the choices of specific sounds can be contrasted.

Step 4: EXPERIMENT–SELECT 'The visual cue: choosing your specific sounds'

In *Butterfly* movie 'take one' there are about seven layers of sounds. There is the protagonist which is the butterfly himself, and he is the main focus. So I followed the sound around the screen. The way that I created the sound of the wings flapping was quite a synthetic way. I took a very quick repeated sound to mimic the movement of the wings as the butterfly carries itself around the actual frame. And then I added movement to the actual sound. This is known as modulation and within music it is a very common type of effect to give a sense of movement and dynamic to an actual sound. Within this I decided to follow the movement of the wings by choosing volume curves and panning effects. So I decided that because the butterfly was so beautiful I had to follow it as the camera had followed it around the screen. (Andrew Diey, in interview, 2004)

This showed how much detail Diey applied to one particularly significant sound in the *Butterfly* movie. The careful treatment of sounds in this way is an important step in the sound design process.

In a similar way, the *Futurescape* movie gave Diey the opportunity to knit tightly together particular events on the screen with specific sounds:

It is very easy to see why I chose certain sounds for some of the graphics on the screen. Because there are graphics that come towards you and have a certain sense of motion and the camera quickly turns the corners. These types of visual cues are just delightful to work for from a sound and music point of view it gives you a point from where to turn the music or where to add the sounds or how quickly to put the sounds in or make them fade out. (Andrew Diey, in interview, 2004)

But how did he know whether two sounds would work well together?

A lot of that is down to experience really. But if you are starting out the important thing is to experiment and see what happens when you put two sounds together. (Andrew Diey, in interview, 2004)

The importance of experimentation prior to selection is one of the resounding themes of the interview with Diey and the observations of his work. It is through this process of experimentation that he was able to achieve 'happy accidents':

It is often the case that you'll get happy accidents. The way to get happy accidents is to throw things at each other and see if they work. And once you see that certain things do work you'll know that in the future when you do come to do another set of visuals you can have these two elements working together. Experiment, experiment, experiment and learn your craft. That's what it's all about. (Andrew Diey, in interview, 2004)

But what did he do when two sounds did not work together?

There are a couple of cases where a sound just won't work. Either the sound is completely wrong or the sound needs a little bit of work done to it. The vast array of sound treatments that you can work with vary from equalisation, filtering, pitch-shifting, etc. Within these basic processing types you have a million different options. *If the sound doesn't work and you keep trying to make it work then just get rid of it.* Use another sound. It's very simple just dump the sound. If something doesn't work after you've tried several times then move onto the next piece. It's very simple. Not all sounds do work together. Not all sounds are meant to work together. Experiment. [my italics] (Andrew Diey, in interview, 2004)

Step 5: EXPERIMENT–SELECT 'Additional elements'

The penultimate stage in the sound design process was the inclusion of additional elements into a particular sound design. In Diey's work, these elements took a number of forms including the addition of:

- Specific musical events or elements within the general soundscape of the sound design;
- Particularly important sound events that could potentially change the entire dynamics of the sound design;
- Discrete but powerful ranges of digital effects to all or part of the sound design.

(i) *The inclusion of specific musical events or elements.* The second *Butterfly* sound design is perhaps the best illustration of the inclusion of additional elements. Within this sound design, Diey chose to add a powerful rhythm section and drone to the

sounds of the butterfly movements. This completely changed the dynamic of the sound design.

So you still have the movement of the wings laced on top with the sounds of a very, I wouldn't say aggressive, but more powerful sounding chords underneath that. There is a certain sense of dynamic and movement and structure and the sounds were just sort of carrying the butterfly along, giving the butterfly a sense of urgency without compromising what his daily duties were. (Andrew Diey, in interview, 2004)

This incorporation of musical elements allowed Diey to interpret the same movie in a very different way from the naturalistic portrayal discussed above. He conceived this version as representing the adult perspective of a professional sound designer as opposed to the initial version from a child's viewpoint:

The *Butterfly* take 2 movie is very much a contemporary, up-to-date version of how I feel about music and sound. The perspective that I have nowadays compared to when I was a child as in the first movie you could say is twenty years on with a whole plethora of twenty years experience of being in a very enriched music world. (Andrew Diey, in interview, 2004)

(ii) *The inclusion of particularly powerful sound events that have the potential to change the entire dynamic of the sound design.* Diey's interpretation of the *Citydrive* movie was from the first person perspective of travelling through a changing cityscape in a moving automobile. This perspective made obvious demands on him as a sound designer, not least the inclusion of sounds from the automobile:

So my choices for the immediate acoustic environment were to look at the car and the sounds the car will make. So I chose a varied selection of car engines to give the emphasis on what type of car we are in. (Andrew Diey, in interview, 2004)

The choice of car sound and the way in which it was mixed within the sound design had important consequences. Diey's definition of his environmental perspective allowed him to make clear choices about other sound events that can be included or precluded from his sound design:

Because we are within a car there is a perfect environment in which to ignore the sounds outside or to embrace the sounds outside. You could imagine listening to music or to having the windows open and enjoying the sounds that are coming from the exterior. The choices I made were to try and bridge the gap between being isolated within a car and including yourself within the actual city environment. (Andrew Diey, in interview, 2004)

The imaginative extension of this first person perspective was a key component of a creative approach to working with sound and picture. The ability to imbue certain sound events with significance beyond the obviously semantic was a characteristic of 'painting in sound'.

(iii) *The inclusion of discrete but powerful ranges of digital effects to all or part of the sound design.* There are huge and powerful ranges of digital effects that can be added to individual sounds (akin to small brush strokes) or applied to the whole composition

(in broad brush strokes) as part of the final mix. The use of such digital effects is, in itself, an important part of the compositional or artistic process. Diey discussed the use of such effects within particular sound designs, e.g. the huge metallic structure of the radio telescope in *Nature Technology* . . .

the way that it moves and the way that when it does move it moves with slow and bulky sounds. So a lot of the sounds in there are pitched down with reverb to give the impression of very slow moving metallic structures. (Andrew Diey, in interview, 2004)

As with the butterfly's wing and the modulation effect, volume curves and panning effects that were applied, it became apparent that Diey applied digital effects for particular artistic reasons. Whilst an experimental approach to processing sounds quickly produced the most amazing range of sound effects, he was able to make artistic choices and provide good explanations as to what he was attempting to do and why he chose particular courses of action to achieve this.

Step 6: STRUCTURE–EVALUATE/REVISE 'The final mix'

The final section is the structuring together of ideas into a final, linear sound design that then needs to be reduced from its composite tracks into a final stereo mix:

The mixing down process in sound design is very similar to mixing music or very similar to DJing. You have one record here, you have another record here and you mix the two sounds together. Sometimes the beats match and sometimes they're out of synchronisation and you need to match them up. Mixing down is very much an art form that people have perfected over the years and it only comes with experience and playing around with how the sound levels work together. What I would suggest to continually try to experiment with different types of mixes on your overall piece of audio. (Andrew Diey, in interview, 2004)

The concept of experimentation applies here just as it has done throughout the whole compositional process.

Conclusion

Sound design is one example of current artistic practice dominated by the computer and other digital technologies. Within the work of a sound designer are a host of new skills and imaginative practices with hardware and software that have tremendous potential for those music educators seeking that 'major shift in culture and established practice' (DfES, 2002, p. 19).

Eisner's comments, quoted earlier, about the potential and challenge of the computer come in a chapter entitled 'Visions and Versions of Arts Education' which seeks to describe some of the aims and content of arts education programs common in schools today. He states clearly that there is no 'sacrosanct vision of the aims of arts education' and that 'examples of diversity abound' (Eisner, 2002, p. 25).

Eisner's summary of the five principles of arts education helps to summarise the application of sound design to educational practice.

(i) Art education should give pride of place to what is distinctive about the arts

Sound design is a distinctive and contemporary artistic practice that has recently become dependent on new technologies. It contains a range of artistic skills, often specific to the uses of new technologies, that widen the opportunity for pupils to engage in musical composition. For these reasons, if nothing else, sound design is worthy of inclusion in the music curriculum.

(ii) Art education programs should try to foster the growth of artistic intelligence

Ability in art is assigned to talent, ability in 'intellectual subjects' is assigned to intelligence. (Eisner, 2002, p. 43)

Intelligence takes many forms. Sound design exhibits peculiar forms of artistic and musical intelligence within the cultural context of an enriched technological environment. Intelligent evaluation and reflection on the process of creation is a common theme in Diey's work. At times it is reflection on the visual image, a sound's place in the movie or its relationship to other visual elements; on other occasions it is reflection on the purpose, function and expressive affect of individual sonic events.

(iii) Art education programs should teach how to create and experience the aesthetic

Eisner's suggestion is that within curriculum development the arts 'can, and probably in most situations will, be addressed in an integrated fashion' (Eisner, 2002, pp. 43–44). *Sound2Picture* has shown that sound design allows teachers and pupils to jointly consider aspects of visual and musical significance and investigate their relationships within the digital medium. Pupils now have another opportunity to create and experience the aesthetic through an integrated model of arts education.

(iv) Art education should help pupils recognise what is personal, distinctive and unique about themselves

Personal responses are key to all arts education. Diey has provided examples of this through *Sound2Picture*, especially with his work on the *Butterfly* movie. A pupil's personal response to a movie is the key to his or her own creative work in this medium. Choice of starting points is vital in achieving depth and quality in this kind of work. Creating educational situations in which pupils can express and develop their personality, character and creative spirit is the key for teachers. *Sound2Picture* is just a starting point for this work. (Examples of pupils' work can be viewed at www.sound2picture.net.)

(v) *Art education programs should make special efforts to enable pupils to secure aesthetic forms of experience in everyday life*

Each subject studied in schools affords the student a distinctive window or frame through which the world can be viewed. (Eisner, 2002, p. 45)

Finally, Eisner draws attention to a larger issue that arts educators hope to address, i.e. facilitating in pupils an appreciation of the wider world as a rich source of meaning when viewed within an aesthetic frame of reference. In a sense, the work done by Diey in the *Sound2Picture* project is materially linked to the every day. The raw materials of his craft are the found sounds that have been recorded, manipulated and mixed together in the digital environment. The treatment of everyday materials as potential artistic objects has long been recognised as an artistic opportunity:

I believe that the use of noise to make music will continue and increase until we reach a music produced through the aid of electrical instruments which will make available any and all sounds that can be heard . . . The present methods of writing music will be inadequate for the composer who will be faced with the entire field of sound. (Cage, 1968, p. 4)

In typically provocative style, John Cage neatly summarised what he saw as the inadequacy of traditional methods of music making in light of the changing conceptual and technological basis on which musical materials are defined. How do we empower our pupils to compose when faced with such a challenge?

Notes on contributor

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Websites

- Alchemy Audio Lab: www.alchemyaudiolab.com
- Sound2Picture: www.sound2picture.net
- Sound2Game: www.sound2game.net
- UCan.tv: www.ucan.tv

Appendix: Movie descriptions

Movie 01: Citydrive

Citydrive is a first person perspective from the interior of a moving car. The themes are cities, people and motion.

Movie 02: Nature Technology

Nature Technology takes two opposing entities and puts them side-by-side in film. On one side there is nature (plants, animals, weather) and on the other technology (communications, structures, cameras).

Movie 03: Butterfly

Butterfly follows a butterfly on its daily duty of pollinating flowers and hovering gracefully in the process. It is also entirely shot on the butterfly's own terms, the camera following the butterfly throughout.

Movie 04: Graphix

Graphix is an abstract multi-textured visualisation of style, colour and contemporary ideas. Images fade in and out, passing forwards and backwards, left and right, up and down creating abstract themes and fast motion.

Movie 05: Motion Static

Motion Static is a fast paced collection of images based around the theme of electricity and power. Motion plays a large part in the movie and the sharp camera work gives a large industrial feel to the movie.

Movie 06: Futurecity (computer animation)

Futurecity is a 'city' (buildings, vehicles, populations) set in the 'future' (the world of science fiction and fantasy). The movie shows structure and moving shapes all displayed in a computer animated, 3D wire frame. This is not a realistic movie, more of an abstract view of a futuristic metropolis that one travels through on a flying camera.