TECHNOLOGY AND CREATIVITY IN THE CLASSROOM: AN OPPORTUNITY MISSED?

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ABSTRACT
Technology systems and practice for use in music composition have developed rapidly over recent years. As a result creative possibilities have opened up not only to Higher Education but also to music composition at 11-14 years. However technology is not being used to its full potential to encourage pupils to explore their creativity in music composition at this level. This paper presents a study of this issue in the context of the National Curriculum for England, UK. It discusses relevant academic discourse, investigation findings from Government and regional secondary school level and proposes intervention in the form of action research. This involves the design, development and deployment of software learning resources within an 11-14 music classroom setting. If successful the results may be of potential use to others who operate in 11-14 music educational settings in an international context.

1. INTRODUCTION

1.1 Music technology: an extraordinary sound space
Music technology has continued to develop rapidly over recent times with powerful computer systems and technological devices becoming increasingly accessible to users. Such powerful systems and devices have also become increasingly accessible to the music classroom causing vociferous debate of why and how they might be used effectively [1] [2] [6]. The sonic possibilities offered by such technology are considerable extending far beyond that of traditional notated frameworks and acoustic instruments. There is a sound space that is an open universe of continuums and possibilities ‘where every sound and imaginable process of transformation is available’ [8]. However using such massively powerful capabilities offered by new technological systems effectively for composing requires the user to understand how they might be creatively deployed:

...using computer technology for composing provides a link between what can be imagined and what can be heard...the extraordinary sound space is an obvious attraction to composers although they need to overcome the barrier of knowledge to be able to make use of this potential [3].

This statement remains as pertinent as ever.

1.2 Composing: imagination and creativity
Composing music provides a meaningful vehicle for imagination and creativity. The process allows the mind to explore ideas, which at the point of them being imagined may be worth very little musically, but there comes a point when imagination and decision-making become involved.

Significantly for music educators creativity in music is that pupils use sound as the medium for creative thinking [4]. To encourage such imagination and creativity, using technology for composing provides enormous potential. But how might fledgling composers effectively acquire knowledge to make use of such potential? At what point in a composer’s development should technological knowledge acquisition begin?

1.3 Music technology in music education
Music technology can be ubiquitous as a term yet ambiguous as a discipline, if it is one at all. Generally it falls across the disciplines of art, science and technology and can have differing connotations depending on the context in which it is used. Technology as a term can mean ‘art’ or ‘skill’ [7], which if applied in the context of learning to compose music makes accessible all the possible techniques of the technology of the culture in which it is applied. Consequently in the context of music education the use of acoustic, electronic, digital or computer systems (for composing or otherwise) merely become amalgamated as ‘music technology.’ In this context to omit the computer is to omit the piano or guitar.

The use of music technology therefore extends the sonic possibilities in music composition and is an extension of
the knowledge and practice available, which should be imparted through music education of any emancipatory cultural setting. Embracing the use of music technology is to liberate compositional possibilities challenging the composer’s imagination and creative thinking as to how these might be used effectively to make music.

Such use of music technology for composing can be seen in Higher Education contexts where increased creative potential is possible. However this potential is not being completely fulfilled in the 11-14 music classroom [4].

2. THE CHALLENGE

In England, UK. the use of music technology for music in schools for 11-14 year olds is statutory. It should be used ‘to create, manipulate and refine sounds’ in composing and performing activities [5]. However a recent report [4] suggested it was underused, particularly at 11-14 years. Curriculum opportunities should also be provided for the development of creative thinking and compositional skills and in exploring ways music can be combined with other art forms and other subject disciplines [5]. However appealing or not this statutory ‘marriage’ of composing and technology might appear, to a music teacher teaching in England it cannot be avoided. Encouraging this creative relationship in compulsory music education at 11-14 years is one challenge concerning this study.

2.1 Issues of Impact

Issues impacting nationally can be seen impacting regionally in the 11-14 year old music classroom. The provision of music technology resources can be extremely variable between schools and often dependent on the experience and knowledge of music staff. Music teachers are often highly qualified and very experienced musicians. However that musical experience may not necessarily extend to knowledge and experience in the field of music technology.

Music technology resources in the classroom typically include a computer workstation with a MIDI keyboard attached through a MIDI interface. The software of choice is often more appropriate to professional music production or music publishing. There are other music software packages available specific to this age group which are marketed along educational lines although these employ a ‘building block’ approach to composition based on pre-recorded musical audio loops mostly of fixed musical lengths.

Deployment of resources often appears extremely constrained and limited. Consequently teaching and learning activities often seem very rushed and pressured to produce musical artifacts to assess, rather than promoting meaningful musical learning. The compositions produced often place an overreliance on MIDI and seem overly simplistic rarely encouraging pupils to do more than make patterns of notes.

Approaches such as these make use of only a small range of the technical possibilities available. Such approaches do not deal with, what for many composers would feel is a central feature of the medium: the ability to shape and mould sound in an extended sound space. Such use of technology need not and should not be exclusive in composing activities but nonetheless should feature to allow pupils to learn meaningfully how sound can be used for other forms of music composition. Exploring an extended sound space through technology should not be confined to the domain of the electroacoustic composer.

The challenge therefore is to explore this music educational opportunity, to extend composing in the 11-14 classroom beyond traditional notated frameworks of pitch and rhythm and encourage pupils to imagine and explore the wider sound universe.

3. INTERVENTION

Intervention has been implemented in the form of action research. This project is collaborative, working together with schools to try and improve the situation in the classroom. The aim being to increase the effective use of music technology in an 11-14 year classroom setting to encourage pupils to explore their creativity in music composition.

The project has been planned and designed with experienced music teachers for deployment within their existing 11-14 year music teaching using available resources within their schools. Other resources such as schemes of work, lesson plans, learning materials and software tools are developed as part of the project being made available as a project package on interactive CD-ROM or other accessible format. The project cycle has been planned for delivery over a limited timeframe where pupils may progress at differing paces through each stage. Depending on particular school resource constraints this timeframe can be adapted on an individual basis. Evaluation takes place during each teaching stage and at the end by all participants in the form of recorded, observed and written evidence. This is analyzed and reflected upon with the results informing the next cycle of the action research.

3.1 Considering Software Tools

A central concept behind the action research project is to allow easy access to the learning environment those powerful technological processes that are in frequent use for shaping sound in Higher Education contexts and the wider music composition profession. Processes typically found in sampling and synthesis resources processing time and frequency domains of digital audio signals. These are often complex pieces of software and/or hardware that may require specialist experience and knowledge to install, operate and maintain as well as substantial amounts of finance to acquire.
3.2 Developing Software Tools

Software tools are being developed as part of this project to try and allow easy accessibility from a teaching, learning and financial perspective. The tools are programmed using the software Max/MSP by Cycling74 and are compiled in the final instance as a standalone application. The application can be made available for both Windows XP® or Apple OSX® computer platforms. Each tool implements a time or frequency domain processing technique designed to be simplistic to operate yet effective in scope. The tools are intended to be easily deployed to enable the effective exploration of sound to be meaningful, interesting, enjoyable and fun.

The processing techniques employed in each tool include independent pitch-shifting and time compression/expansion, delay, filtering, reverberation and ring modulation. These particular techniques have been chosen for this project to allow effective exploration of the fundamental elements of music.

3.2.1 Rubber Sound Player

This tool allows the user to play a soundfile and explore pitch and speed playback independent of each other. It employs granular techniques in order to separate the two processing parameters. The interface allows a soundfile to be loaded or created and a graphic display of the waveform is provided. The sound can be played back in its entirety or looped if desired where loop points may be dynamically altered to explore rhythmic aspects. The two main parameters to be manipulated are 'pitch' and 'speed'. The processed output of the tool is saved as a re-sampled soundfile to allow distribution to other software applications such as Audacity for structuring. The audio driver output can be ‘Rewired’ to other applications if desired. This tool also acts as the sound source for all the subsequent tools.

3.2.2 Sound Delayer

This tool allows the user to play a sound and explore the effect of delay. It employs the storing of a sound signal to a delay line in memory that can be recalled later in time. The interface provides a graphic display of the sound currently being played and three adjustable parameters for delay time (msec), feedback amount and mix level. Again the processed output of the tool is saved as a re-sampled soundfile, which may be distributed to other software applications as required.

3.2.3 Sound Filterer

This tool allows the user to play a sound and explore the effect of a range of two pole filters including a typical LPF, HPF or BPF. The interface provides a graphic display of the sound currently being played, a menu to choose a filter to be implemented and three adjustable parameters for centre-frequency, gain and bandwidth (Q). Again the processed output of the tool is saved and distributed as described in the previous tools.

3.2.4 Sound Reverberator

This tool allows the user to play a sound and explore the effect of reverberation. This tool makes use of multiple delays and filtering to produce a reverberation effect. The interface provides a graphic display of the sound currently being played and two adjustable parameters for reverb length and mix (100% dry -100% wet). Again the processed output of the tool is saved and distributed as described with the previous tools.

3.2.5 Sound Warbler

This tool allows the user to play a sound and explore the effect of ring modulation. This tool makes use of the ring modulation theory using carrier and modulator oscillators, with LFO rate and amplitude control. The interface once again provides a graphic display of the sound currently being ring modulated and adjustable parameter controls for frequency, LFO rate and amount. Again the processed output of the tool is saved and distributed as described with the previous tools.

The tools described here are not considered final in any way and are still undergoing testing in schools. They remain subject to evaluation and revision as part of the cyclic nature of the action research.

4. EARLY RESULTS

Early results of the initial action research cycle are very positive and encouraging. A pilot project was implemented with a cohort of 11 year old pupils of mixed gender and
social backgrounds. The music learning focused on the fundamental elements of music that were to be demonstrated in a thematic soundscape composition. The project involved pupil discussions of thematic ideas, listening activities to develop audible perception, sound sampling within the school environment, listening evaluation and discussion of the elements of music within the context of what sound(s) had been sampled. The software tools were used to manipulate samples to create new sounds to demonstrate exploration and imagination based on thematic ideas. The samples created form part of a digital sample library accessible to other music teaching within the department or across other disciplines across the school. This project is part of an ongoing cycle of action research once further analysis has taken place.

From a technical point of view the software tool application was successful. It was loaded to a school network server and ran across a computer suite of 30 PC desktop computers running Windows XP® operating systems. As processing requires the host computer CPU and RAM the application also runs from a USB flash-stick requiring no installation, thus increasing accessibility both in and outside school. The GUI and general intuitiveness unsurprisingly was not without criticism although all features and parameters did function correctly.

Feedback from the pupils and staff who participated was very encouraging. Staff felt very positive about the project and felt it had helped them to introduce the use of music technology into the curriculum for use in composition earlier than they had done in previous years. They felt that it enabled them to encourage pupils to explore their imagination and creative thinking especially in exploring the elements of music in new and meaningful ways. Pupils on the whole gave very positive comments about the whole project. They enjoyed using the technology to capture sound, they participated well in discussions talking about different aspects of sound and created some interesting new sounds which they were able to discuss with positive intent. They had both positive and negative comments about the software tools although the positive ones were extremely positive and the negative ones were much less profound in nature and concerned mainly the general GUI and intuitiveness. However it is felt the issues can be addressed through some focused revision and further testing.

5. A WIDER CONTEXT

The content of this paper is intended to demonstrate a potential opportunity to music education of using technology to encourage pupils to explore their creativity in 11-14 music composing. It has briefly presented a study of this in a context of the National Curriculum for England, UK. Some issues have been presented which suggest that this potential is not being fulfilled. As a response software tools have been devised and deployed to help improve the situation and are currently being tested as part of action research in schools. If this proves successful then the results may prove useful to others working in similar educational settings and could be deployed in a much wider context, which may include internationally.

6. REFERENCES