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THE SOUNDS OF MUSIC

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Introduction

Why would it be useful to have children provided with the opportunity to be able to engage creatively with the art of organising sounds? Where might such instruction fit into a school's curriculum? In an epoch of limited time allocated to music teaching in several nations, why consider introducing the music of sounds beyond the music of notes? The rationale for the first question will form the core of this chapter, and its place—not only in a music curriculum, but also in several others—will be illustrated. Two of the key points presented will be the raising of aural awareness and the low entry threshold for making music with sounds using known user-friendly forms of technology. The chapter will include a discussion of a modest number of initiatives in the area—there have alas been too few—and will focus on the EARS 2 pedagogical project (ElectroAcoustic Resource Site 2), led by the author, which includes an eLearning environment and creative software called Compose with Sounds, originally intended for the 11–14 year old age group but currently in use within a wider age range.

To Commence

The chapter investigates what the author has called *sound-based music* and why it would be useful to include it as part of a music curriculum. Sound-based music is defined as "the art form in which the sound, that is, not the musical note, is the basic unit" (Landy, 2007, p. 17). The discussion commences with a brief delineation of the subject including the introduction of some of the relevant key terms. After this, the chapter continues with a presentation of the educational rationale focusing on why introducing the art of sound organisation to young students can be beneficial for a number of reasons. Associated with this, the question of where such instruction would best fit into a school's curriculum will be tackled, taking into account that different countries and, in some cases, different regions within countries make different curricular demands on their schools. The rationale section is followed by a survey of initiatives related not only to creative activities but also educational projects in the field as well as introducing relevant literature. One of them, led by the author and known

by its acronym EARS 2 (the ElectroAcoustic Resource Site pedagogical project, http://www.ears2.dmu.ac.uk), will be introduced at some length to illustrate how the educational rationale can be put into practice. The survey and case study will be followed by the article's concluding words.

The history of artistic endeavour focused on the organisation of sounds is not our focus here, but it is perhaps useful to note that after Edgard Varèse described his compositions as 'organised sound' in the 1920s (he would start working with non-instrumental sounds in the 1950s), two pioneers opened up the breadth of musical material independently and more or less simultaneously, namely John Cage and Pierre Schaeffer. In the case of Cage, he takes Varèse's clear description and suggests that one can hear organised sound anywhere, and proposes a very open-minded attitude, suggesting that music is everywhere as long as we're willing to listen to it. Clearly this statement remains controversial today but has been perhaps the most important means of opening up the discussion on how far one can broaden the notion of what the word 'music' actually means. Schaeffer is the person who launched what was to become known as 'musique concrète,' that is, music in which any sounds can be used as material. The first musique concrète pieces, in particular the 'Cinq Études de Bruits' were composed in 1948. Since this time, various practices, most (but not all) involving technology, have evolved that focus on the art of sound organisation. Sound material can range from acoustic sounds presented without any form of technology to sounds sampled from daily life, which subsequently can be manipulated, to electronically generated sounds or any combination thereof. Compositions can be made for a fixed medium, meaning that they are produced prior to performance and the recording is presented and perhaps spatialized over several loudspeakers in concert. They can be performed live involving real-time technology. They may even take on the form of installations thus potentially linking organised sound to both music and fine art. This opening up of music to the use of any sound is similar to 20th-century dance opening up its movement material from, for example, a strict collection of ballet moves to any form of corporal movement. Technology has taken on a significant role in that art form as well as it has in all others.

Today a number of terms are in circulation related to sound-based music. The most common are electronic music, electroacoustic music, electronica, sonic art, sound art (often associated with fine art) and computer music (a bit broader as this term has to do with anything a computer can be used for within any kind of music). In some of these cases people define these terms in dissimilar ways. Genres include soundscape composition, which is highly focused on real-world sounds and contexts; acousmatic music, a successor of musique concrète, where the genre's name derives from Pythagoras (who used to give lectures behind a curtain so that people could not see what they heard); and various types of music based on sound generation including noise music. A variety of definitions for these terms and hundreds of others related to sound-based music can be found on the original ElectroAcoustic Resource Site. An interesting noteworthy point is that a good deal of sound-based music does not fit neatly into either art music or popular music; many pieces cross over the two and a good deal appears to belong to neither of them. This is perhaps no surprise due to the sonic worlds that open up given the enormous increase of potential musical material, not to mention technology supporting it.

Educational Rationale

The key question in this section of the chapter is: why would it be useful to have children provided with the opportunity to be able to engage creatively with the art of organising

sounds? In other words, in an epoch of limited time allocated to music teaching in several nations, why consider introducing the music of sounds beyond the music of notes?

These questions are difficult to discuss with a single argument in a book with such an international readership. Challenges faced by music educators at primary and secondary level vary greatly internationally and, in many cases, regionally as well. Beyond the obvious challenge faced by many educators of being allocated an optimal amount of time with students for music instruction, other discussions that have been going on for years relate to some teachers' desire to broaden the introduction of repertoire to young people including making various forms of today's music relevant to them. This broadening may include various forms of popular music, music of other cultures and, as in this case, rapidly developing forms of living contemporary musical production.

There are several arguments supporting the introduction of sound-based music to young learners. These include the raising of aural awareness, the low entry threshold related to creativity, cross-curricular benefits and benefits related to more generic skills. These will be treated individually in a moment. Before doing this, another question may already be in the minds of some readers. Given the relative absence of most 20th- and 21st-century contemporary music on the radio and its relatively weak impact on today's cultural profile, why choose sound-based music, a theoretically radical margin of contemporary music, in music education at all?

The answer to this question is fairly straightforward. Making music with sounds may indeed be innovative as is a great deal of contemporary art music. In the case of music made from, say, Schönberg onwards, the large gap between the 'known' in music for most listeners and the 'unknown' that atonality and other forms of contemporary music introduced afterwards led to music of acquired taste, and the time for the acquisition of that taste could be fairly extensive depending on the composer. Many listeners have had neither the opportunity nor perhaps the patience to spend that amount of time finding other forms of art more accessible. In the case of sound-based music, at least music with sounds whose sources can be identified, links with lived experience can be discovered, similar to the links one makes when hearing a piece of tonal music and compares that with other forms of music in one's lived experience, thus offering the listener something to hold on to from the start. In the Intention/Reception project (Landy, 2006; Weale, 2006) it was demonstrated that inexperienced listeners from the mid-teens upwards found selected sound-based works worthy of repeated listening. In fact the statistics gained in this project were higher than the researchers had expected. With this knowledge of potential interest, a lobbying tool for government ministries wanting to exclude such music from education has evolved. This data, plus the fact that the organisation of sounds can be heard not only in music but also in computer games, films, advertisements and so on, means that students need only to become aware of the fact that it already plays a role in their lives. With this in mind, let us now return to the rationale.

Aural awareness + translation into sonic/musical understanding. Thanks to leading figures in soundscape composition, including R. Murray Schafer (who wrote many texts for music education, for example, Schafer, 1986, and sounds in our daily lives, Schafer, 1994) and Barry Truax (1984), we have been reminded that today's society involves a good deal of tuning out. Think, for example, of the day-to-day sounds we do not consciously pay attention to, music in shops, televisions, radios and mp3 players in the background in our homes and elsewhere, and so on. These people and others have called for an increase in aural awareness and complain about sound pollution as many complain about air pollution. They make

music that reflects their interest in their acoustic ecology involving closer listening to sound and the details that sounds possess.

Increased aural awareness can support increased visual awareness. This is done normally by introducing young people to various aspects of sound in space and subsequently taking them on what is known as soundwalks. In my recent publication, *Making Music With Sounds* (Landy, 2012), a significant section of the book focuses on means of increasing aural awareness for younger learners as a first step on the journey leading towards the ability to creatively organise sounds musically. As part of this, awareness of musical concepts including pitch, dynamics, rhythm, sound quality (e.g. timbre and texture), space and much more can be discovered. Once this first step has been taken, one can discuss combinations of sounds either from a single sound source or from multiple sound sources. This, in turn, has various cross-curricular benefits (see later in the chapter). As one listens with great concentration to detail, other senses similarly become more aware.

Low entry threshold. Young people today are often more at ease with various consumer technologies than their parents. With this in mind, the ability to learn about sounds and sound-based music and apply this knowledge creatively in a composition environment is actually more straightforward than when teaching instrumental and vocal music, as no five-line notation and all that comes with it is needed. This author has met music educators in Europe and East Asia who, after an introduction to the subject of our case study, have stated that through increased aural awareness and the enjoyment of discovery of combining sounds creatively, in fact, some children who might find the introduction of music theory difficult may discover that it becomes more accessible as concepts from sound-based music are easily transferred into the world of do-re-mi.

Cross-curricular benefits. Clearly in most cases sound-based music will be introduced using various forms of technology, such as recording devices to capture sounds from digital recorders to mobile phones (for those who are unable to record sounds, the Internet offers sites such as Freesound where people can download a wide variety of sounds recorded by others); software programs in which sounds can be input or generated, manipulated, placed into sequences and subsequently shared during performances; and other computer possibilities including discovering knowledge and repertoire on the Internet or by way of eLearning environments that specifically focus on this very subject. The notion of Internet music involving collaborative online music-making might also be discovered during this learning experience. In short, many important aspects of music technology and thus IT can be introduced within this area.

Looking at what has been presented in the previous paragraphs and taking into account that any curriculum introducing sound-based music will include various musical, technological, theoretical, historical and other components, it comes as no surprise that many other school subjects will benefit or, in fact, can be taught simultaneously. When increasing aural awareness, aspects related to subjects ranging from basic acoustics and perception (science) to geography and ecology might be introduced. When learning about how sounds are made, mathematics is often relevant. When discussing sounds and sound qualities, in order to represent them on a score, a link with fine art can be made regarding how best to visualise sound. If one were to introduce the notion of a sound installation, aspects of design would be of crucial importance. This is only a selection of how the discovery of sound-based music can support learning in other subject areas.

Benefits related to generic skills. As awareness increases and knowledge is developed in the relevant areas, the step towards creative application is of fundamental importance. Asking

young people to compose is difficult, not only for the students themselves, but also for a significant number of teachers as well. As sound-based music need not focus immediately on historical precedents involving the learning of particular structures and so on, there is more scope towards immediate discovery. In so doing, various generic skills come into play. Both communication and analytical skills are important when describing sounds and aspects of sound quality as well as when discussing what one is trying to achieve when working creatively. In cases where learners work together, collaborative skills are developed. When presenting work, aspects of performance can be involved. All of these are important items related to a learner's confidence. At the Music, Technology and Innovation Research Centre at De Montfort University in Leicester (UK), where the author is based, post-graduate students have gone into schools with sound-based musical instruments or short curricula with creative software and discovered that often students with communication or learning difficulties have come out of their shell as they make discoveries whilst playing with sounds (see, for example, Cutler, 2014).

With all of this in mind, sound-based music can obviously be introduced in music lessons, lessons focused on music technology or in joint lessons with any of the subject areas mentioned earlier. It certainly also offers an enjoyable way to learn about various aspects of IT.

Survey of Selected Initiatives and Publications

The number of classroom-based initiatives related to sound-based music thus far has been rather finite leading this author to write *Making Music With Sounds* and initiating the EARS 2 pedagogical project. The late 1960s and 1970s was a period of experimentation in schools leading to a number of important publications in music education that supported aspects of contemporary music, including making music with sounds. Educators seeking to broaden the music curriculum in this manner include Paynter and Aston and Swanwick and Taylor. The first how-to books related to electronic music were written at that time using technology many teachers today and their students will never encounter. More recent examples focusing on sound-based music-making in schools include publications by Savage, Challis, Therapontos, and Higgins and Jennings, the latter including a project website, 'Organising Sounds', as a result of their project. The first educational product made for schools involving sound-based music-making is 'Sound Experience' (Myatt, 1991). This list is just a selection, but an exhaustive survey would alas not be terribly long.

Beyond these publications, more recent initiatives of relevance range from the first software made for children that introduced forms of sound synthesis, NOTAM's 'DSP for Children.' The Sound.son initiative has involved collaborations between schools where children share sounds that they have collected and collaborate making pieces with them online. The British organisation Sound and Music has hosted a number of schools projects that have involved both aural awareness and sound-based music—for example, their successful Minute of Listening and Sonic Postcards projects. These projects are very much in line with the goals of the chapter, but have unfortunately remained isolated initiatives. A unique venue for sound-based music can be found in Berlin in the form of an organisation called Ohrenhoch, der Geräuschladen ('Prick Up Your Ears, the Sound Shop'). This prize-winning organisation is an education centre in which there is a learning space for sound-based composition workshops, DJing and the like. There are no entry requirements and free concerts are offered.

For readers who would like to discover educational and more general literature related to this subject, texts by Brown, Hugill, Storms, and Vella and Arthurs offer aspects relevant to pre–higher education levels of music technology, all of which include discussions related to this chapter's topic. For university-level introductions, see also Chadabe, Collins, Schedel and Wilson, Cox and Warner, Holmes, Manning, Prendergast, and Toop. An excellent French-language CD-ROM, 'La musique électroacoustique', is also recommended (INA/GRM Hyptique, 2000) and will be referred to later. For bibliographic references related to specific aspects of sound-based music, the EARS site offers a large searchable bibliography in a variety of languages and includes several thousand titles related to sound-based music.

Case Study: EARS 2

The history of the EARS 2 pedagogical project started at the UNESCO headquarters in Paris. UNESCO supported the original EARS site and was focused at the time on its Digiarts initiative opening up media arts to young people around the globe. They believed, and were justified in their view, that there was a large hole in the market regarding sound-based music and the young. They asked whether an EARS junior site could be developed. This modest question led towards a large, ambitious UK-based project that was launched in 2015.

The project's vision is as follows: open up the world of sound-based music to children (in the first instance, and interested people of all ages as well) in a user-friendly and enjoyable manner. It is the development team's intention to offer this package in as many languages as possible (and several are being developed at the time of this volume's publication) for international use, taking into account that there exists a variety of forms of education in different countries as well as the fact that schools possess diverse levels and amounts of technological equipment—no trivial challenge.

Having written a first book for teachers in the 1990s on experimental music in general (Landy, 1994), I had already established the view that writing specific exercises with specific technological demands and an expectation of a particular level may work in countries with national curricula, but is not realistic with an international readership. The chosen alternative assumes little technology and offers flexibility in terms of the levels of difficulty in the exercises so that they are adaptable according to local circumstances. EARS 2's associated book, *Making Music With Sounds* adopts this principle, and its eLearning programme is similar. It assumes no number of hours for each subject, as this will differ from classroom to classroom. Nonetheless, a linear programme of learning is available to teachers who would like such a curriculum. In this they can choose to visit as many or as few pages as they like. EARS 2 offers teachers' packs to those with little experience with sound-based music in order to support any new concepts on offer and include suggestions for students who find things difficult, regarding assessment and the like. The packs also include clear information related to cross-curricular aspects of particular lessons and web pages.

Influenced by the aforementioned CD-ROM 'La musique électroacoustique', which is divided into three sections, EARS 2 uses similar main headers, namely 'create,' 'learn' and 'listen.' There is also an encyclopaedia where users can learn more about any given concept. *Create* is to do with the software, Compose with Sounds (CwS), that was developed with a number of European partners[1] and supported by an EU Culture grant. Currently CwS is a composition platform in which sound-based works are created in stereo. Planned future enhancements are listed later. *Learn* is related to all aspects of knowledge acquisition ranging

from basic sound-based musical concepts, to aspects of technology, history, and so on. *Listen* has to do with repertoire and relevant sound examples.

EARS 2 is founded on a concept-driven approach. What this means is simply that no concept is introduced in isolation. If one is dealing with a concept such as real-life sounds, the genres and categories related to it will be presented, techniques for treating real-life sounds compositionally introduced and illustrated with historical and current sound examples. Any technical and/or musical information related to these concepts will be presented at the same time. In this way there is no delay between, for example, the introduction of a musical approach and the techniques and technology associated with it, a holistic approach to learning.

The eLearning environment has been made as attractive as possible for its target audience. The original age group focus when the project commenced was 11–14 year olds, that is, the start of secondary education. This has subsequently broadened by about two years in either direction with no ill effects. The learning environment and CwS have been made as intuitive as possible for users to avoid frustration and time loss.

As stated, nothing is assumed other than a computer running Windows or Mac OS X, an Internet connection and loudspeakers. Where more types of equipment are available, the opportunities for music creation and performance increase proportionately, but this in no way means that those with minimal dated equipment are at a disadvantage.

EARS 2 is multi-navigable. The linear programme offers learning at three levels (like a computer game), most likely 3 years of learning over a restricted period of five to six sessions, but not necessarily. There is so much material that the duration can be expanded. For those with little time, an introduction to a finite set of subjects within this progress is also possible. Teachers or general users can construct a bespoke navigation based on themes or interests or, just like most Internet sites, can surf ad libitum. The linear progression commences with basic concepts, such as the following which are related to sonic techniques offered on CwS: volume, pan, simple delay, echo, splice (cut/paste), simple reverberation, reverse, fade, time stretch/compression, truncate and loop. The second level regarding this subject adds reverberation, frequency modulation (low/vibrato and high frequencies), amplitude modulation (low/tremolo and high frequencies), transposition (pitch shift), filters (high-pass, low-pass, high/low-pass, band-pass, band-reject, multiple band-pass), distortion, noise, asymmetric delays and Attack-Delay-Sustain-Release (ADSR) envelope. The final level contains ring modulation, additive synthesis, chorus, flanging, breakpoints (all parameters including multipoint envelopes), subtractive synthesis, granulation, harmonising, convolution and convolution reverberation prior to introducing, but not pursuing, highly advanced concepts such as physical modelling that are normally learned at university level.

This list is based on the functions that are found on CwS. A similar list could have represented the various levels of knowledge related to soundscape, acousmatic or noise composition or sound art.

Listening is approached in a few ways. For beginners, there are examples of guided listening, in which questions are asked during playback to make students more alert about details related to content, technique or context of recordings. Later on the concepts are learned and the examples are there for illustrative purposes. Similarly listening strategies ranging from a focus on the source to one on the sound quality are also introduced.

Assessment tasks can be found in the form of short quizzes, longer evaluations and creative assignments that can be uploaded to CwS's own website. Students earn badges as they progress in order to develop confidence. Further detailed information about the history and

the creation of the prototype of the site can be found in Wolf, 2013; information on the site itself can be found in Landy, Hall and Uwins (2013).

In the case of CwS, the illustration portrays the basic sequencer platform. Every form of sound generation and manipulation has its own modulation window and specific means of modification that are both sonically and visually altered when the user is at work, again as intuitively as possible. This is based on a clear 'what you see is what you get' approach. Similarly, the so-called sound cards (when chosen in groups, the term 'sound card pack' is used) have images on them that correspond closely with what is heard.

Future enhancement for CwS include a visual layer, for example, video input prior to the addition of a sound-based composition generally known as post-synchronisation. A new version for touch screens is planned, as is controller input so that users can perform whilst using CwS. The version allowing for haptic performance will be called CwS Live. Other plans include spatialisation beyond stereo and perhaps an Internet-networked version of CwS.

EARS 2 will continue to be developed and will be largely dependent on feedback from users (teachers, students, other individuals). As its content increases, new versions in other languages will appear. Four countries beyond the UK, ranging from Argentina to China, have already committed to create their language version of EARS 2. These rapid supportive actions demonstrate the international need for an adaptable platform for the introduction of sound-based music. Discussions are underway with one European country to investigate EARS 2 being adopted as part of its national curriculum for music. As more people learn about the wealth and diversity of this corpus of music, it will become better known and, in time, the number of people participating in it will increase. Communities of interest will evolve locally and internationally and, hopefully, sound-based music will earn the interest and respect it deserves.

Conclusion

Children in their early years always find it of interest to make funny sounds with objects around them and vocally. Some of this may have to do with their discovery of note-based music. Some of this is sound-based fun which gets lost at a later age if not reinforced. The music of notes is an essential aspect of all cultures. The rapid growth of the music of sounds has demonstrated how infinite possibilities of sound and structure need not become daunting for newcomers, but instead open a door to a form of art that can be linked to our daily lives, our new technologies, music in general and the audio-visual media world. There is clearly a place for it in today's and tomorrow's education programmes.

Note

1. Beyond the author's institution, INA/GRM (Paris), NOTAM (Oslo) and ZKM (Karlsruhe) were project partners, and EPHMEE/Ionian University (Corfu) and Miso Music (Parede, Portugal) were associate partners.

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