COVER SHEET

Changing Technologies, Changing Minds: Taking account of music technologies in the curriculum[1]

Andrew R. Brown
Queensland University of Technology
a.brown@qut.edu.au

Introduction

Our music education history is littered with changing technologies and the future horizon seems equally full of new technological developments. As a part of maintaining quality and relevance in our music curriculums this paper seeks to reveal the way technological change interacts with the music curriculum to change the minds of our students through their musical understanding. Such change can best arise through growth and development in the student through making and reflecting with a variety of technological resources, from paper and pencil to instruments and computer.

Although sound recording technologies have been the biggest technological change effecting music education this century, digital technologies, in the form of computers and synthesizers, are the most visible technological change with which we are currently engaged. In order to understand how these changes can best serve music education we need to be clear about the ways in which technologies interact with thinking. The technological environment in which the student can developed is established by the teacher and the curriculum, so choosing engaging activities and appropriate technologies is vital.

The Story of Ewan

Ewan was a music student who had been learning trumpet for five years and been active in music classes. One day in he was introduced to a music sequencing program. It all seemed straight forward enough; the sequencer acted like a tape recorder he surmised. He played in some music, then added a new track, and so on, building up a complete arrangement and hearing it back. One curious, but useful, aspect of the sequencer was that it could pay back the music at different tempi but maintain the pitch. Ewan's tape machine metaphor had to be adapted a little to accommodate this, but he noted that this multiple tempi ability was the same as his own performance of trumpet pieces at different speeds. He also noted that the sequencer was able to replay a recording with a different sound than the one he used to play it in. This certainly was different to a tape recorder, and again his own experience soon provided a model, he noted that in his band it was possible for different players to play each other's part. Ewan started to think that the sequencer was perhaps more like a resident band than like a tape recorder, and what a help this would be for doing his arrangements.

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In another class Ewan was shown how the program was able to display his sequence in common music notation. Wow! This was exciting. He remembered all the hours spent writing out arrangement assignments, and considered how he might now be able to avoid much of that work. Not only could the computer be a band but it could be copyist as well. His euphoria was dampened somewhat when he noted that at times the computer displayed notation incorrectly. "That's stupid!" he exclaimed more than once at this realisation. He soon learned how to replace the few offending notes and decided that even with those editing requirements the computer overall saved him some time, and the output was neat as well.

This experience of incorrect notation started to unfold in Ewan's mind over the next few days. Why had the computer not been able to write the correct notation? Why did his attempts at deleting a rest fail, and require him to move the note instead? Ewan decided to try some experiments with the program next time he used it. He was frustrated that a staccato phrase was shown as alternate semiquavers and semiquaver rests. Slowly, he began to recognise that the program's notation may be closer to what he really played, but that the score was easier to read as crotchets with staccato markings. He began to realise how the extent to which the notation he played in lessons could be interpreted in many ways. Through reflecting on the computer notation experience, the interpretive knowledge he had acquired became more obvious to him. This change in metaphoric understanding, the sequencer as tape recorder to sequencer as band-at-the-ready realisation, transferred to the way he now looked at notation on paper as well. But the question of the inability of the computer program to delete a rest still puzzled him.
Ewan asked his teacher about why the computer would not delete a rest. "This computer program automatically puts rests wherever there are no notes, so the only way to remove a rest is to have a note occupy that space" his teacher responded. This seemed very odd to Ewan. He searched his experience for a precedent but none was to hand. When he had used pencil and paper he could rub out a rest. Ewan confronted, in this example, a fundamentally different way of understanding silence in music. He started to wonder, "Was silence part of music or simply the absence of sound?" and "How could the makers of the program have come up with that way of considering rests?" Ewan was not sure that he liked the way the program dealt with rests, but it lead him to question the way music was represented.

Redefining Technologies

What is technological about music curricula that we might change? Most radically, of course, the textual nature of the curriculum document itself. However, let us begin more modestly by examining the technological resources available to the curriculum developer.

Technologies available to the music educator include printed documents, musical instruments, mechanical tools (such as metronomes), electronic and digital audio devices, MIDI sequencers, computers, printers, telephones, internet communications, and the like. Clearly then, books are a technology, trumpets are a technology, and computers are a technology.

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The story of Ewan addressed changes between print and digital technologies; which ca be regarded as changes in media. For Ewan, confronting this change in media resulted in a fundamental musical questioning about the role of silence in music through its representation as notation. As well as computer notation there are a number of electronic and digital technologies which, over the last few decades, music curricula have been challenged to incorporate. These include the tape recorder, CD, video, synthesizer, and more recently the MIDI sequencer. Each technological development usually builds on the previous technologies, usually by metaphoric implications in design and therefore in the mind of the curriculum developer and student user. For example, the sequencer uses tape recorder terms such as track and rewind. Ewan understood the sequencer as a tape recorder at first, then as a band able to play his arrangements, then as electronic paper displaying notation. With each change in metaphoric understanding Ewan gained new insights into musical concepts. The metaphoric shifts rather than simply media substitutions are the significant technological changes.

Changing Technologies

The use of music technologies for capturing and presenting student activities has resulted in changing curriculum in the area of delivery and assessment. Students are now able to produce audio, video and multimedia assessment items. These advances have resulted in changing the minds of teachers and curriculum developers about best assessment practice. Videoing a performance rather than holding central examinations is a case in point. The ability for students to produce presentations on audio tape rather than in print creates opportunities for integrated sound examples and enables equity for verbally orientated students to express themselves. Ewan, in our story, may have gone on to produce an assignment based around one of his arrangements which included a score, a sequenced demo tape, a video of a live performance, and a text report describing the objectives, arrangement techniques and a criticism of the outcome. In a multimedia environment these formats could be integrated digitally and links between them established; for example in a multimedia report Ewan could draw upon examples of sequenced and live versions of his arrangement to illustrate the changes in timbral expectations and results.

Multimedia document formats require changes in the curriculum in terms of skill development for authorship, criteria for critical evaluation of new media forms, and adequate infrastructure for creation, storage, marking and feedback. For example, do the students and teachers working in multimedia formats have flexible and sufficient computer resources to create and assess such work? Are timelines varied to reflect changes in development and production from text or performance-only equivalents? Are the curriculum objectives able to be met by, or redefined to account for, such changes in media? How best are the artificial barriers between instrumental and classroom music education dissolved through focusing on integration via multimedia outcomes?

Changing Minds

While changes in technological resources can make a significant difference to the ways a music curriculum manifests itself, changing minds requires a more pervasive

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shift than mere substitution of resources. Changing minds is about changing metaphors.

Varying the way we represent musical knowledge by changing technologies has two implications: 1. Musical knowledge can be represented through different media, as in the case of music notation being represented on paper or on computer; 2. Musical knowledge can be represented through different metaphors, as in the case of a timbre's similarity to an instrument design or to its acoustical attributes. A sound may be described as woodwind like, or brass like. Alternatively, timbres could be considered as sound objects (Schaeffer, 1952) described by their time envelopes, degree of internal complexity, and processes applied to them, in the manner used in Musique Concréte.
The interaction of the music student with a variety of metaphoric descriptions of music inherent in different technologies will, if reflected upon, develop the student's musical understanding. In the story of Ewan we note that the change in metaphoric understanding of the sequencer shifted from tape recorder to band-at-the-ready and then to music copyist.

Although significant in themselves, the substitution of media may not lead to significant changes in thinking if they employ the same metaphors. The value of changing technologies without shifting metaphors can be in improved efficiency, financial savings, and increased integration of the new media; as is the case with substituting manuscript paper for most computer notational packages. But these may simply be expensive efficiency gains.

Changes in metaphor result in significant changes in thinking; in new potentialities for understanding the world of music. These changes occur with technological change to varying degrees, but are often transparent and little considered (Brown and Purcell, 1988). For example, the shift from class music performance on recorder to electronic piano has obvious changes from monophonic thinking to polyphonic and homophonic, and vertical pitch physicality to horizontal, and abstract octave variation to visual. However, the change from electric piano to synthesizer has important but more transparent implications (at least possibilities) including a shift from a pitch and time focus to a timbre-time focus, from a one-to-one correspondence between gesture and sound-event to a one to many possibility (using complex sounds, arpeggiators, and auto performance options), the ability to determine sonic parameters beyond percussive note onset, and significant changes in repertoire possibilities particularly in contemporary music genres. Curriculum designers should be vigilant in their consideration of the metaphoric shifts they implement as they introduce technological change in the music education programs, as it is these shifts which result in the most significant changes in the minds of students.

Curricular as Text-nology

Importantly, to enable significant curriculum development the music curriculum as text-only document needs to develop into a multimedia document. One writer who recognises this effect is Dillon, who in discussing music education and 'multiple logics' notes that "Print and its linear processes no longer dominate thought and

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communication and we now combine the word with images and sound in multi media communication which represents actual or imaginary experiences" (Dillon 1995:21). Educators themselves need to change technologies they use to more directly influence the understandings of their students. Just as the way-of-knowing changes with the use of different media and their associated properties and conventions, including inherent metaphoric potentialities, so does the curriculum document need to be changed in its communicative powers by becoming a multimedia document. Communicating our artistic curriculum intent only through text involves unnecessary abstraction and disembodiment, as Barrett notes;

> Statements may be the instruments of enlightenment, but not the only ones. As soon as we are freed from the notion of the single proposition as the ultimate locus of truth, which [sic] each proposition carrying its truth on its back like a rider on a saddle, we are also freed toward understanding other modes through which truth may be realized. In particular, we might begin at last to ask seriously in what way truth may be embodied in works of art. (Barrett 1987:143)

Introduction of multimedia curriculum documents can be seen in a number of Australian states where CD-ROM's of exemplar materials are being prepared as support material for senior music syllabuses. The changes that non-text-only curriculum development will produce are impossible to predict, but we can be confident that the universe of possibilities is more likely to be sympathetic with musical understanding if curriculum documents include sound and gesture.

Curriculum development currently centres around written documents. Text is an abstract representation, it is in the very broad sense, technical. Text objectifies the things it describes, it stands for them and apart from them, this is both its power and its weakness. Sound and vision are more direct, experiential, modes of understanding. Their direct nature makes them less objective, less abstract, and their musical communication potential more rich. The shift to multimedia documents for curriculum development can lead to changes in the minds of both those developers, the teachers/artists implementing those curriculums, and in the students who participate in the curriculum delivery. Deeper and clearer musical understandings will be possible as curriculums are conceived and communicated via the richness of information and metaphors, both theoretical and experiential, of multimedia documents. Non-textual data can include audio and video recordings of performances, musical scores, and 3D visualisations of objects and spaces.

A change in media is only one part of the change. When moving from text documents to multimedia ones, which including sound and vision, there is an educationally desirable metaphoric shift which becomes possible. This shift involves a changing away from technological thinking, from theoretical understanding, to aesthetic development and to experiential understanding. Directness of experience is the basis of Croce's (1900) hierarchy which suggests that sensory impressions from experience lead to intuitive or aesthetic knowledge which in turn is represented propositionally as declarative knowledge. In reflecting on Croce's knowledge hierarchy Swanwick

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suggests that "The only justifiable reason for selecting any musical activity as part of an educational programme is that it has the potential of significant engagement at the intuitive level." (Swanwick, 1994:33). There is an apparent irony that in order to avoid technological thinking we need to change technologies. However it is not at all ironic, but obvious, that to address an issue of technological thinking, we need to address the issue of technology. Not in order to use less, as technological thinking is part of being human, but to use it purposefully and knowledgably.

Reflecting Change

In the story of Ewan, he is confronted by the assumptions of the both print and computer notation through their juxtaposition in his music education. The change from print technology to digital technology enabled different ways of representing music, and so of understanding music. Ewan's confrontation with these mediums lead to a questioning which ultimately expanded his appreciation of the way music is notated, represented, and thus understood. Ewan's questioning relies on a naturally inquisitive mind, but similar results can arise in all students through an appropriate focus on reflective thinking, through the active raising of the issues by teachers. A greater number of students can engage in the developmental learning which Ewan experienced when provided with a teacher-devised opportunity to reflect on similar questions to those which occurred to Ewan.

As we change the nature of the technological environment in which we and our students operate, new understandings are possible, and some others may be hidden. The technology can then play the role of 'cognitive amplifier' as well as 'tool' and 'instrument' (Brown, 1994, 1995). But educators need to consciously exploit the potential of technologies by contextualising technological changes in music making activities and providing reflective opportunities which maximise learning from those experiences.

As we change to digital technologies we can let expressions, reflections and response be sonic, visual and textual in the one medium. Communicating the curricular message can be rich with meaning and concrete examples. Music is abstract until it is sound. Digital technologies enable us to work with music as sound, text, score and video and multimedia combinations of these. Changing technologies can change experiences which then expose new ways of thinking. We can, in fact, change minds by changing technologies.

About the author

Andrew Brown is a music educator, composer, synthesizer player and researcher. He is currently working as a lecturer at QUT in Brisbane, Australia, focusing on QUT's Music Production specialisation where music making with, and for, new media is practiced and researched. Andrew enjoys the rigorous search to better understand and practice music making and how our tools enable it.

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