

# Teachers' use of digital technology in secondary music education: illustrations of changing classrooms

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*The music industry in the 21st century uses digital technology in a wide range of applications including performance, composition and in recording and publishing. Much of this digital technology is freely available via downloads from the internet, as part of software included with computers when they are purchased and via applications that are available for some mobile phones. Such technology is transforming music and the way people approach many traditional music activities. This paper is about transformative practices that are underway in some secondary school music classrooms. Practices are being shaped by the culture of the schools and the students that they recruit. We describe the perceptions and practices of nine music teachers in four New Zealand secondary schools with regard to digital technology and how they are changing their work in their classroom. Data collection techniques include interviews, observation and a questionnaire. The data were subjected to two stages of thematic analysis. Grounded analysis was used to allow the teachers' voices emerge. This was then followed by the application of five themes identified in the literature on pedagogic change prompted by teachers' adoption of digital technologies.*

## **Introduction**

Information and communication technologies (ICT) transforming approaches to teaching in primary and secondary schools are part of a much larger social and cultural change driven by the arrival of these technologies (Savage, 2007). The use of digital technology,<sup>1</sup> forming part of the resources used to support learning in a music classroom, is today accepted in a number of countries around the world such as the USA, UK, New Zealand and Hong Kong, and is considered a necessary and desirable part of the teaching and learning environment (Mills & Murray, 2000; Beckstead, 2001; Ho, 2004; Edwards, 2005). These countries have spent considerable time and money implementing this technology in music education. Implementation has been accompanied by research into how this form of technology is being used in music lessons and how effective that use is in respect of students' learning about and appreciation of music (Mills & Murray, 2000; Pitts & Kwami, 2002; Hargreaves *et al.*, 2003; Ho, 2004; Edwards, 2005; Button, 2006; Crow, 2006; Westerlund, 2006; Savage, 2007).

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The development and proliferation of digital technology in the music classroom has been particularly rapid over the last decade and its presence has, as Pitts and Kwami (2002) predicted, had major implications for music educators. For example Burnard (2007) asked questions related to how the teacher's role might change in different pedagogical contexts relative to music, what creative practices enhance effective use of technology in the music classroom, what teachers and their students learn from these experiences, to what extent teachers learn from the students who are often likely to be more technology savvy than the teacher, and how the teachers experience being new learners themselves.

We know that technology is deeply embedded in the contemporary lexicon of many young people's musical lives and that the internet is their playground. Young people tend to have familiarised themselves with ICT innovations before their parents and teachers have – a reversal of the usual hierarchical roles. Various commentators (e.g. Prensky, 2001, 2009; Jonassen *et al.*, 2003) stress that the students attending our 21st century schools are products of the digital age in that they have spent their lives surrounded by and using computers, video games, digital music players, mobile phones and all the other tools and paraphernalia of what is also called the information age.

According to Prensky (2001) these 'digital natives', as he terms them, appear to think and process information in ways that are different from those of their parents and grandparents. More recently Prensky has changed his view as we have moved further into the 21st century and indicates that not all young people can be referred to as 'digital natives' and that the distinction between digital natives and digital immigrants has become less relevant (Prensky, 2009). A particular challenge that technology brings music teachers is that of finding ways to bring into the school setting the knowledge that students develop outside of school about digital music composition and production. A subsidiary challenge is that of moving technology from its position as an 'add-on' in the music curriculum to a position of being embedded within the curriculum.

Students of today do not know a world without the digital technologies associated with music making and listening – among them computers, electronic keyboards, MP3<sup>2</sup> files and players, compact discs, the internet, and a range of other digital music devices and formats (Webster, 2002). He suggests that these students and their children will, in time, come to know and use technology for producing and communicating music that are barely understood or even conceived of today.

According to Cain (2004, p. 219), 'Curriculum change is necessary if the world of the classroom is going to keep pace with the world outside. And it is necessary to have a clearly defined theory which allows teachers to commit themselves intellectually to the change.'

Although many of the challenges as described above are appreciated by teachers, and it is known that many of today's secondary school students are high-end users or consumers of music technology, there is little evidence about what their music teachers know about technology in regard to their practice, how they deploy, or might deploy, this knowledge in the classroom, and what they learn from doing so. Burnard (2007) suggests that a universal aspiration for all music educators is to improve the quality of musical learning and its relevance to the young learner. As such, she suggests that we need to carefully consider if a music teacher's capacity to use technology effectively matches the educational needs of his or her students. In today's ICT-driven world, music teachers are under pressure to accept that they do not know everything and that they are not the holders of all musical knowledge (Green, 2008).

Music teacher educators are also challenged with the considerations listed earlier. In addition there are a number of broader questions, such as: Is technology a new means of serving traditional goals in music education or can it offer us something different? Can teachers use technology to bring 'real world' experiences (e.g. students composing and recording songs and then posting them on YouTube, Facebook etc.) into the classroom? Those questions are at the heart of a larger research project. This paper describes the current practice of nine music teachers in four New Zealand secondary schools. It examines their perceptions of the use of digital technology in music education and explores their approaches in the utilisation of such technology in their classrooms.

## **Literature review**

### *What is music technology?*

Understanding as to what we mean when we talk of digital technology relative to music (often referred to as 'music technology') varies. According to Murray (cited in Pitts & Kwami 2002, p. 61) music technology refers to 'any situation in which electronic technology is used to control, manipulate or communicate musical information'. Webster (2002, p. 416) describes this technology as 'inventions that help humans produce, enhance and better the area of sound organised to express feeling'. Byrne and MacDonald (2002) define music technology in the classroom by itemising the components of that technology. Thus, they include electronic keyboards, sound modules, multi-track recorders, synthesisers, hardware sequencers (such as those contained in the on-board sequencer in keyboards), and a wide range of software applications that allow sequencing, notation, editing and recording through MIDI-based<sup>3</sup> and acoustic means.

The development of micro-technology in the 1980s not only affected the production of electronic instruments but also their application. Memory chips and microprocessors in electronic keyboards enabled instrumentalists to produce a range of sounds that had previously been unattainable. The development of electronic devices that could 'talk' to each other using MIDI, linked keyboards, drum machines and computers were particularly important in this respect. Pitts and Kwami (2002) suggest that this development marks a defining point in music education.

More recent developments include more powerful computers becoming cheaper to buy and accessible for a greater number of people. Faster internet connections, via broadband, have made it easier to access varied music-related software and files. These newer components of music technology have allowed people who previously would not have considered themselves musicians to handle, create and communicate music via their computers. More specifically, they are able to use inexpensive software that does not require 'traditional' music skills or conceptual understanding of music (Crow, 2006).

### *Pedagogical use of the new technologies*

In a review of relevant research literature on ICT use and pedagogy, Way and Webb (2007) suggest that much of the material reviewed generally distinguishes between practice involving teacher-centred approaches and practice involving student-centred approaches. They also note that ICT use in teaching and learning context is sometimes associated in

the literature with innovative classroom practice. They furthermore reference the growing body of research that identifies the potential of ICT to transform pedagogy in the following ways:

- A shift from instructivist to constructivist educational philosophies.
- A move from teacher-centred to student-centred learning activities.
- A shift from a focus on local resources to global resources.
- An increased complexity of tasks and use of multimodal information.

Kiesler (cited in Beckstead, 2001, p. 47) refers to the use of technology as either 'amplicative' or 'transformative'. What is meant by the former is that technology in the classroom can be used to do traditional tasks better or more efficiently. A transformative impact, however, is one that 'shows a qualitative change in how people think, act and react'.

Much of the literature surrounding the popular rhetoric about technology revolutionising teaching, or teachers fundamentally changing their lesson plans, indicates that while there may be some 're-shuffling of the cards', there is little evidence of anybody 'trying a new game' (Hennessy *et al.*, 2005). The ImpaCT2 study, a longitudinal study undertaken by the UK Department for Education and Skills (DfES) and the British Educational Communications and Technology Agency (BECTA, 2004) showed that 'relatively few teachers are integrating ICT in a way that motivates pupils and enriches learning or stimulates higher-level thinking and reasoning' (p. 156). A 2001 study by Cuban of Californian schools with a long exposure to ICT confirms that ICT use is usually restricted to teachers using technology to do what they have always done, even though, in fact, they often claim to have changed their practice (Cuban, 2001).

Much of the research on teachers' use of ICT in their teaching describes low level of usage and minimal pedagogical change (Somekh, 2008). Somekh argues that much of the research surrounding teachers' adoption of ICT does not consider socio-cultural theory, which clarifies that processes of change in schools and classrooms cannot be understood in isolation because of the influence of regulatory frameworks and policies of national education systems and national cultures. Thus, she argues, although teachers' beliefs and attitudes and their confidence and competence with ICT remain centrally important in their adoption of ICT into their pedagogy, teachers are not 'free agents'. Rather, their use of ICT for teaching and learning depends on the 'inter-locking cultural, social and organisational contexts in which they live and work' (p. 460).

#### *Pedagogical uses of ICT in secondary music*

As discussed earlier, the implementation of ICT in the music classroom is now the accepted norm internationally. Specific reference is made to its use in curriculum statements in a number of countries from around the world. There are a number of international studies describing research surrounding this implementation and how it may be used to meet specific curriculum requirements (Busen-Smith, 1999; Mills & Murray, 2000; Odam, 2000, 2004; Pitts & Kwami, 2002; Ho, 2004; Gouzouasis, 2005; Savage, 2005a; Crow, 2006). Many of these reports relate directly to the use of ICT in raising achievement in composition (Berkley, 2001; Pitts & Kwami, 2002; Berkley, 2004; Crow, 2006). Some studies refer to

developing performance skills (Chan *et al.*, 2006) whilst others refer to the development of wider musical literacies that students may develop in the modern music classroom (Savage, 2005*b*; Crow, 2006).

Further research has examined the changes to pedagogical practice that teachers may need to make as a result of the technology being used in their classrooms (Beckstead, 2001; Byrne & MacDonald, 2002; Pitts & Kwami, 2002; Savage, 2005*a*, 2005*b*; Crow, 2006; Burnard, 2007; Woody, 2007). Many secondary school music teachers are products of the Western classical tradition, which is based largely on the conservatoire and the associated skills and traditions that this brings with it. These teachers may have difficulty understanding the need to use ICT in the classroom or may accept or welcome its use but not be comfortable to operate in a genre that is foreign to them. Often too, they have difficulty in understanding or accepting the contexts and genres in which the students wish to work. One of the real challenges facing music teachers will be to create scaffolding structures that will allow students the freedom to express their creativity in contexts that are relevant to them and support this with knowledge, skills and resources appropriate to what the students are doing (Hargreaves *et al.*, 2003). Teachers may need to be prepared to broaden their understanding of what constitutes composition and performance in light of the changing practices that ICT can bring to music in its various genres (Savage, 2007). Using technology may make teachers rethink instructional practice and transform the way they have done things for many years (Bauer *et al.*, 2003). Therefore there is a need to hear teachers' voices about their practice in music classrooms in the 21st century. This paper explores the practices of nine secondary school music teachers in four New Zealand schools.

## **Method**

### *Participants*

There were nine teachers who participated in this study located in four local secondary schools. These teachers had been asked to participate in the larger research project. The schools were:

- An independent boys' school – School A.
- An independent girls' school – School B.
- A large co-educational state school – School C.
- A smaller co-educational state school – School D.

These schools were initially selected for the study because they are all considered to have flourishing music departments that incorporate a high level of ICT and associated digital technology in the courses offered to students. School A and School D used Apple Mac computers in their music departments; School B and School C used PCs.

The second factor influencing the decision to target these schools was based on the socioeconomic background of the students. In Schools A and B, the majority of students come from high socioeconomic backgrounds. School C's students are drawn from a mixed range of socio-economic backgrounds. The majority of students from School D come from

low socio-economic backgrounds. School D also has the highest proportion of Māori and Pasifika students in the school.

The final factor influencing choice of schools concerned the mix of styles of music available to students in the schools. Schools A and B achieve well in national choral competitions. These two schools endeavour to offer as varied a music programme as possible and try to incorporate opportunities for students to work with jazz and rock where possible. School C and School D enjoy a strong reputation for high levels of achievement in jazz and rock in relevant festivals and competitions. School D also achieves highly in specialised competitions, such as Pasifika Beats (Polynesian music) and kapa haka (Maori performing arts).

Of the nine teachers involved in this study, three were female and six male. Two teachers each were teaching at Schools A, B and C. The remaining three were teaching at School D. Table 1 presents a summary profile the group. Included here are the age band of the nine teachers, their teaching experience, specialism in their music degrees and their role in their departments. The computer platform used and access to the internet in the classroom are also included.

#### *Data collection and analysis*

Data were gathered utilising a mixed-method approach. All teachers were asked to respond to a questionnaire in the final term of the school year; follow-up interviews took place approximately one month after an initial analysis of the questionnaire data using questions developed based on the information gathered. The initial questionnaire was informed by information retrieved from the literature review. It was refined by piloting at another local school. It asked the teachers about their personal use of digital technologies at home and at school and their use of specific composition software, such as Sibelius and GarageBand. They were also asked to give their opinion on the extent to which digital technology can support performance skills, composition, theory and aural skills components of music, and knowledge of music works, as required by the New Zealand curriculum.

The main source of data was one semi-structured interview with each of the nine teachers. Each teacher was observed in the classroom at least once to validate the data gathered. Each interview took approximately 30 minutes to complete. The teachers in School B and School C requested that they be interviewed together. The questions asked during the interviews focused on what software the teachers used and why, what they thought of software that involves using pre-recorded loops, any changes in their pedagogical approach because of the use of such software, and what they might like to do in the future in terms of utilising developments in digital technologies.

The interviews were recorded and transcribed. Data were analysed using a two stage themed-analysis approach (Stake, 1995) and were then categorised as described in the next section of this article. The themes used were the four offered by Way and Webb (2007) and one from Somekh (2008). Way and Webb describe the potential of ICT to transform pedagogy by facilitating shifts from instructivist to constructivist philosophies, from teacher-centred to student-centred learning activities, and from a focus on local resources to the use of multimodal information and a resultant increase in the complexity of music-related tasks.

Table 1 Profiles of the nine participating teachers

School	Teacher	Age (years)	Teaching experience	Specialism(s) in degree	Responsibility in school music	Computers	Internet access in classroom
<b>A</b>	1	41–50	25–30	Performance Classical Composition	Choir Composition	Apple Mac	Yes
	2	51–60	25–30	Performance Classical	Orchestra Composition	Apple Mac	Yes
<b>B</b>	1	41–50	21–25	Performance Classical	Orchestra Composition	PC	Yes
	2	31–40	16–20	General Arts Vocal	Choir Composition	PC	Yes
<b>C</b>	1	31–40	11–15	Performance Jazz, Rock	Rock, Jazz Composition	PC	No
	2	51–60	25–30	General Arts	Assistant Composition	PC	No
<b>D</b>	1	31–40	11–15	Performance Jazz, Rock	Jazz, Rock, Concert Bands	Apple Mac	No
	2	31–40	11–15	Performance Jazz, Rock	Rock Composition	Apple Mac	No
	3	21–30	6–10	Performance Jazz, Rock Composition	Rock, Jazz Composition	Apple Mac	No

The final theme (Somekh, 2008) required analysing the transcripts from the socio-cultural theoretical position described earlier in this article.

## Findings

The findings are presented using the themes discussed following analysis of the questionnaire and interview data. These include teachers' own access to and use of digital technology and any digital resources available in the classroom. Also included are any changes to teaching practice and preferences regarding using digital technology for music-making compared with using more traditional means. These are now discussed with illustrations coming from the questionnaires and interviews.

### *Teachers' access to and use of digital technology*

It was evident from responses in the questionnaires and comments made in the interviews that all of the teachers involved in this project could be described as high-end users of technology. Results from the questionnaires showed that all teachers had computers at school that they used regularly in a wide range of applications such as preparing resources, arranging music etc. to help them in their teaching. Only one of the nine did not have a computer at home. The remainder described similar usage at home to that at school and regularly moved material between the two, either via email or a portable data storage device. All of the teachers used some form of digital technology (see next section) in composition activities. Two reported using other software such as Music Ace to support teaching traditional music theory; four referred to accessing YouTube to find material that could support performance skills and activities related to music history.

### *Classroom resources and how they were used*

All the teaching spaces observed had a high level of technology, with a number of computers and keyboards seen in the four schools, and all of the teachers involved in this study had access to this type of equipment in their classrooms. As discussed earlier, the development of keyboards and interfaces with computers in the 1980s revolutionised many of the traditional activities involved in music education (Pitts & Kwami, 2002).

The item of software that all nine teachers were using in their classes was Sibelius. This software is used throughout the world for the creation of traditional music scores, and is the most commonly used software in compositions requiring a score with traditional Western music notation. Teachers in Schools A and D said they were also using GarageBand, a sequencing software program that comes as part of the integrated iLife package supplied with Apple Mac computers. GarageBand allows users to create pieces of music using the pre-recorded loops of a wide range of instruments. Users can also add their own parts via a MIDI keyboard or via a guitar that is connected to the computer.

In School A, students in their first year of secondary school are first introduced to Sibelius. In their second year the students undertake a range of activities such as composing advertising jingles and sound tracks for video projects using GarageBand. In School D,



students work exclusively with GarageBand in their junior classes; very few students use Sibelius in the senior classes.

When asked how they used Sibelius, the teachers in Schools A, B and C described some very similar activities. In all cases, students are initially required to copy examples provided by the teacher. From there, students progress to simple tasks, with the teacher providing them with the rhythms and asking them to choose pitches in a particular style (Schools A and B). Alternatively, the teacher provides the students with chord progressions and asks them to provide a suitable melody to play over the chord progression (School C). This second strategy requires the students to have some understanding of music theory and the ability to use traditional music notation effectively.

With Sibelius, the benefit for me is that it actually gets them using traditional notation. This is the best one for me, because that is my aim in Year 9. One of my aims is to actually just get them to read a bit of music. (School A, Teacher 2, interview)

What I have noticed with Sibelius becoming more and more important within the classroom is it actually teaches kids how to read . . . once they start sitting down and using Sibelius, their reading starts really improving, and combining that with live music, it is not only beneficial to composition but it is beneficial to theory as well. (School C, Teacher 2, interview)

The teachers in Schools A, B and C made specific reference to what one of them referred to as 'the spectacular use' by students of Sibelius. This work was carried out as part of the requirements set by the Level 2 and Level 3 composition achievement standards for the National Certificate of Educational Achievement (NCEA).<sup>4</sup> The teachers attributed the quality of the work to students being able to use the features of the software that allow complex notation patterns to be easily replicated and a wide range of sounds to be used, thereby providing an added creative stimulus to students' work.

There is one boy who has done a lot of copying and pasting in one of his pieces, [so much so] that it has become so complex; it is more complex than a John Adams piece, totally unplayable, but the way he did it was very clever. He did that because he realised that he could copy and paste something, so he got cascades of things coming down through the woodwind, and he wouldn't have thought of doing that, had he not got this copy and paste thing. (School A, Teacher 2, interview)

Teachers 1 and 2 at School B discussed a particular advantage that Sibelius offers users – that of being immediately able to play back the music as it is being written. This feature, the teachers said, helps students develop the complexity of their work.

Sibelius, well it is instant, they can hear what they are writing . . . So, for me, it allows them to write far more complex pieces of music in whatever genre it is than they would be otherwise because they can get instant feedback, and it's not relying on having to find somebody to play it for you. (School B, Teacher 1, interview)

Well, look at my Year 12s; it is stunning! There are a couple of absolutely fantastic ones, just 'out of the box'. I was looking at actually that international composition competition that came through and I thought, 'Oh yeah!' But they are truly, honestly unbelievable. (School, B Teacher 2, interview)

GarageBand, a sequencing program that comes as part of iLife on Apple Mac computers, is used in many primary and secondary schools throughout New Zealand (Bolton, 2008). The teachers in Schools A and D were using GarageBand extensively in their respective music courses. School A is unusual when compared with the other four schools because they have retained a 'core' music course in the second year of high school. In the other schools, music at this level is an elective course; the students opting to take music usually do so because they intend to continue studying music in the senior school. Teacher 1 at School A described this Year 10 course as one that focuses on 'an aesthetic education' with the aim of ensuring that all the boys 'have an understanding of how music works and the structure of music'.

In contrast the description by Teacher 1 at School D of how she worked with students when using GarageBand showed a different approach to that taken at School A. For her, this approach offered the students a considerable advantage.

I think, for composition, at a school like School D, they [the students] are not that . . . probably good at writing out compositions. So, the idea that they can, they are full of ideas, so they can play their idea in, and then we can . . . it is almost like doing it in reverse, their ears are so good, that they naturally write things that have great form and good ideas and extension of ideas, but they tend to do it by ear.

Teacher 2 at School D put it this way.

I think for the kids in this school, if you were to say, 'Right, this is a crotchet and this is a quaver, and this is what you will do,' they would go, 'F@#\$ off!' It is as simple as that. But with this [GarageBand], it is, like, 'Hey, woo, you have got a good little idea there, let's find a beat, let's find this, let's find that,' and then suddenly, two months later, this kid is writing their own raps and all that kind of stuff . . . It does mean you can link the theory in later on, after they are hooked completely.

Although Teacher 1 at School A described a similar use of GarageBand, he made it obvious this use was set within the very different context of School A.

The reason I have used GarageBand is because of the loops, where they [the students] can still understand the structure and what makes music work. They do various layering processes, where they have just got to have a rhythm section and then layer it accordingly. So they come up with fantastic things. They do . . . one of their units is advertising, and so they have to write a jingle – they have to do the backing for the jingle, and it has to be 30 seconds long. So, there is all the parameters of what you would do with a normal composition class except that they are doing it in this way.

Other teachers were less convinced of the value of using software that involves using pre-recorded loops. Teacher 2 at School C had this to say about GarageBand. He described the use of looping software as 'just cutting and pasting, and to me that is not composing'. School A's Teacher 2 described GarageBand as useful but 'not as a creative tool, I don't think'. Both teachers at School B expressed similar reservations about what they described as the 'drag and drop' features that allow students to create music.

So you don't have to have a creative spark, or the musical understanding, and they don't have the ability to notate, but it allows them to 'create' something that will sound good. (School B, Teacher 1, questionnaire)

Teacher 2 at School B thought GarageBand was useful for students with limited ability and musical knowledge, but not appropriate for the more musical students in the Year 10 option classes. Teacher 1 at School 3 provided a measured response. His view was that although looping software such as GarageBand allows composition utilising 'other people's loops', recording studios in the music industry utilise loops all the time when creating songs. As such, he considered this kind of technology appropriate to use in the classroom as it is an authentic approach and commonly used in the music industry.

In summary the teachers in Schools A, B and C were using a very similar approach when teaching students how to use Sibelius. The teachers in these schools all discussed the importance of students having knowledge of Western music theoretical concepts and notation. The tasks they created for the students appeared to be designed as part of a sequential learning process leading towards the composition achievement standards of NCEA. The teachers in the three schools described senior students creating excellent compositions because of their ability to manipulate the software to aid the creative process. In contrast, when considering the merits of musical software, the three teachers in School D made it clear that their decision on which type of software to favour was determined by the type of students they typically had in their classes and the type of learning experience they thought best for them. These students, they said, generally responded best to looping software that allowed them to create compositions relevant to them and not requiring understanding of Western music theoretical concepts and notation. This approach by the teachers meant that the students in their classes could complete Unit Standards<sup>5</sup> in composition because these, unlike achievement standard requirements, did not require the students to know traditional notation. The teachers described that some of the students realised the benefits of knowing traditional music theory and notation after they had completed their compositions and were interested in learning more as a result.

#### *Pedagogical change*

The teachers in Schools A and C said they had changed their teaching styles in several ways. Teacher 1 at School A, a very experienced teacher with over 20 years in the classroom, explained in some detail his belief that technology has changed the way all music teachers now work. He considered that students coming to School A from primary schools had received considerable exposure to a range of technologies from an early age, and that these students therefore saw these tools as a commonplace part of schooling and expected to find them at secondary school. Teacher 1 also indicated that he had adopted a far more student-centred approach with the advent of these technologies. He said he was now confident that when he set students a task at the beginning of a lesson, they would achieve it without only minimal teacher assistance.

Teacher 2 at School A held similar views. He was quite clear that the technology now available to him had changed the way he worked.

In some ways it has become me being more of a facilitator rather than a teacher at times. You sit back and watch them do the work, and you try not to intervene too much.

He spoke of how YouTube had made it easy for students to find almost any kind of music being performed live, and that this access, either in class or at home, enabled them to find and compare and contrast different performances of the same piece.

Teacher 2 at School C also felt that the technology available to him had changed the way he taught. He was the most experienced music educator with over 30 years in the classroom. He said that the classroom's data projector and computer allowed him to present traditional theoretical concepts in a more sophisticated manner. He also said he used a lot less 'chalk and talk' than previously. Like Teacher 2 at School A, he discussed being far more relaxed about letting students work on their own and was confident that they would complete the tasks he set them.

Teacher 1 at School C (10 years' experience) pointed out that he had always taught using technology. However, new technologies that had arrived on the scene since he had begun teaching meant that he had still had to change some aspects of his practice. The relatively recent addition of the data projector in his classroom meant he could now project material from his classroom computer so that all the class could easily view it. He said he was now using a lot of wireless technology. For example, with some activities, he would sit alongside the students and manipulate material on the screen using a wireless mouse. The freedom to move around the room and sit amongst students was, he said, a considerable change for him, and one that he and the students enjoyed.

In contrast the teachers at Schools B and D said that they had not changed their teaching style that much despite the technology now available to them. Teacher 1 at School B (20 years' experience) said that although she used YouTube because 'it is a fantastic tool', she had only minimally changed what she presented to the students and how she presented it. Teacher 2 at School B (16 years' experience) said that technology had simply provided her with another means of delivering the content of her lessons. Having computers available for the students certainly made teaching composition easier, but she was still using the same approach to teach composition in more or less the same way she had always done.

For Teacher 1 at School D (15 years' experience) the technology available had allowed her to teach in a more effective manner than she had done in her previous school. The actual content was the same, but her students could now use the computers to create music, not just keyboards and other instruments.

So, I think I haven't had to change a lot about the actual lessons; I think it is just the technology that we are using. It is at a greater level, and it is quicker to use and more effective. (School D, Teacher 1, questionnaire)

The contrast between teachers who had changed their practice and those who had not may be linked to the diversity of the students that they were teaching and the particular context in which they were working, coupled with their own backgrounds and experience.

All nine teachers said responding to the diverse needs of their students was an aspect that had not been changed by the advent of new technologies. All said they were working hard to meet their students' needs, and it was this factor that was tending to influence

the choices they were making about how and when to use digital technology in their classrooms.

However, not all of the teachers were finding it easy to accommodate the diversity, and felt that digital technology was not a panacea in this regard. The teachers in Schools A and B, in particular, spoke of the wide range of abilities and backgrounds of the students coming to their schools and described the expectations they felt the school, parents and students were placing on them to provide a wide range of styles and genres in their music programmes. All four teachers said that some students had experienced considerable use of technology in previous schools and wanted to do the same at high school. Other students had achieved highly in traditional Western music education and wished to continue this at high school. The teachers also all referred to the increasing diversity of styles and genres students wished to work in. All of these matters were making it difficult for the teachers to provide programmes that could accommodate these diverse interests.

Five teachers said that their use of digital technology in the programmes had heightened their awareness of student learning in relation to music which prompted them to reflect on ways they were delivering curriculum content. For example, Teacher 1 at School A spoke at length of his surprise at what some of his 'non-musical' students were able to do using GarageBand. He said he had gained insight into students' aural skills – skills that he recognised were highly advanced but which he felt were not easily measured using traditional Western music education approaches. He described a real change in his thinking about many aspects of traditional Western music education, and was starting to adjust the tasks he sets his students to allow them more freedom to explore GarageBand without the emphasis on traditional theoretical skills, which he felt was limiting the students' opportunities for creativity.

Teacher 1 at School D also described her surprise at the high level of aural skills of the students she worked with. She, too, had changed her approach. She said she realised that the traditional theoretical skills she had previously thought students needed to create effective compositions were not needed: the students were showing they understood how to create good quality work without recourse to these traditional skills. Instead, they were relying on what 'sounded good' to them. The teacher said she was allowing her students to create their pieces of music first and then was helping them examine what they had done and how it fitted with traditional music theory.

#### *Using digital technology for music making as opposed to traditional means*

The teachers in Schools C and D were very clear about the necessity to balance the use of digital technology with the opportunity to develop other musical skills and undertake other music activities. For example, all five teachers said that students needed to have opportunities to play traditional instruments and to play music together. These comments from three of the teachers are typical:

I would like to try and make sure we keep it in check. I wouldn't like to see it take over a department at all. I think it definitely has its place. It must have its place in the modern world, but it has the tendency of 'walk into a room full of computers and that is it'. I wouldn't like to see that happen . . . I wouldn't like to see that happen because

music, as a whole, is exactly that. We will always have technology, we will always be developing new technologies and bringing new technologies into the classroom, but we must limit it, for sure. (Teacher 1, School C, interview)

I still have a great passion for performing, and I still have a great passion and belief that you get kids behind instruments. It doesn't matter if you are using 'Ode to Joy' or 'Paint it Black' or 'The Wall' or 'C U When U Get There'; it doesn't really matter. They get a kick out of being able to play and then out of being able to play together. And it is more enjoyable, it is more interactive, it is more real . . . I just feel it is a more real representation of what our subject is about, and I would hate to think that music, in 20 years' time is all software driven and that, that whole element is gone. (Teacher 2, School D, interview)

I think it is a balance really, not trying to stray too far from . . . like, I think that performance should still be Number One – the student as a performing musician, and then you use technology as an aid to be a better musician and as an aid to compose rather than the reason to compose. (Teacher 3, School D, interview)

The teachers in Schools A and D also discussed the fact that some of the students preferred to work with real instruments when completing composition tasks. These students, they said, weren't always comfortable using the technology available to them when beginning to compose and preferred approaching their tasks using instruments such as pianos or guitars. Some students completed their compositions using Sibelius for work that required traditional music notation. Other students used GarageBand to add backing tracks that may include loops in some parts. A small number of students completed their composition tasks with no digital technology at all.

## Discussion

The nine teachers who participated in this study appear to have incorporated a high level of technology into their activities in the classroom. Data from the questionnaires suggested a general acceptance that computer-mediated activities, such as composition, result in a high level of student engagement and achievement. All of the teachers had students composing music using computer software, although the type of software used and how it was used differed across the schools, mainly it seems, for reasons relating to the teachers' understanding of what would best engage their students in music. The teachers in Schools A and B were also giving students access to internet, most notably YouTube, so that the students could find podcasts and other material relevant to the concepts (composition, performance). YouTube was providing a particularly useful means of providing students with authentic examples of musicians playing pieces they were working on in class or in demonstrating music-related skills discussed in class.

Analysis of the teachers' commentary in the questionnaires and interviews using Way and Webb's (2007) themes provided evidence that the digital technologies available to the teachers had begun to transform their pedagogical approaches, even if the teachers themselves did not see the shift as being particularly marked. For all, there appeared to be a discernable shift from instructivist to a more constructivist pedagogical philosophy. And all gave clear examples of a move from teacher-directed to student-centred activities,

although again the extent of the move differed from teacher to teacher. Where internet access was available, teachers were using it to bring resources from around the world and in a wide range of genres and styles into the classroom. Finally, the software available, whether Sibelius or GarageBand, appeared to be allowing a higher level of complexity than had formerly been the case in the tasks undertaken in the classroom. However, it was apparent from the teachers' comments that while the technologies might have been changing how they were delivering curriculum content and setting up activities for their students, they were not changing their basic teaching approach. This, the teachers said, was driven by the diverse needs of their students. Technology simply provided them with another means of meeting those needs.

Analysis of aspects of the socio-cultural context suggested by Somekh (2008) identified that the most important factor influencing choice of activities was that of the national music curriculum, in particular the requirements of achievement standards in composition. In Schools A, B and C, the activities undertaken using Sibelius were designed to help students know how to use the software so they could complete composition tasks required under NCEA. The emphasis was initially on learning how to use the software, mostly through exercises using traditional Western music notation. In School D, GarageBand was being used for composition tasks but without the emphasis on traditional notation. Students accordingly were offered the choice of either working towards achievement standards (required for completion of NCEA) or unit standards in composition.

Teachers in Schools C and D made specific reference to the balance they felt was necessary between using technology to appreciate, compose and play music and using traditional 'hands-on' means of doing these activities. The teachers were very clear in their thinking that technology was a necessary part of the music courses they offered, but that it was only one part of what should happen in the music classroom. The traditional activities of music-making allowed students to enjoy the experience of working on improving practical skills (e.g. those required to play a particular instrument), to improve their skills in group activities, and to understand what can be done with groups of instruments. These teachers also made the pertinent point, relative to students' diverse needs, that not all students like using digital technologies.

## **Conclusion**

The nine music teachers described in this study used digital technology in their classrooms in ways that they thought would best meet the diverse needs of their students. In line with Burnard's (2007) conclusion, regarding how technology tends to be used in secondary school music classrooms, the teachers were not only using technology to 'serve' tradition but also to enhance the learning experience of their students, at times with, according to the teachers' accounts, some quite dramatic results. The teachers' commentary suggested they were working hard to provide learning experiences for the students that fitted with the lived realities of their world. The teachers here were very aware of the learning needs of their students and were working to develop appropriate activities that the students could easily relate to (Woody, 2007). It also appeared that the teachers' approach in the classroom was becoming more student-centred as they became more comfortable with the possibilities

of the technology and could assess their students' reaction to it and its impact on their learning (Savage, 2005b).

Although teachers' beliefs and attitudes and their confidence and competence with ICT remain centrally important in their adoption of ICT into their pedagogy, teachers are not 'free agents', and their use of ICT for teaching and learning depends on the 'inter-locking cultural, social and organisational contexts in which they live and work' (Somekh, 2008, p. 458). The nine teachers were beginning to examine their practice in response to the requirements of a curriculum which describes music as music/sound arts and the diverse needs of the students who are arriving in their classrooms. They were looking closely at their beliefs about music education and traditional Western music concepts and understandings and beginning to adapt these to meet the challenges that these students pose.

While it could be said that this small study shows limited evidence of a real transformative change in the teachers' practice and the students' learning as a consequence of using digital technology in the classroom, it seems that the seeds of this type of change could be underway in the schools. Further more comprehensive detailed research is planned. A closer look at just how these teachers are changing their practice relative to technology will remain central in that continuing research.

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### Notes

- 1 Digital technology for the purposes of this paper refers to software that can be used in music education and includes sequencing and notation software and video streaming services such as YouTube.
- 2 Digital audio encoding format.
- 3 Music Instrument Digital Interface.
- 4 NCEA is the New Zealand national school qualification.
- 5 A competency-based task based on authentic activities from the music industry.

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