

Music technology inspected: good teaching in Key Stage 3

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How is information and communications technology (ICT) used to promote musical learning by pupils aged eleven to fourteen, i.e. pupils in Key Stage 3? Inspectors from the Office for Standards in Education (OFSTED) visited 52 schools in England, and inspected 161 Key Stage 3 music lessons that made some use of ICT. This article describes the characteristics of the good teaching found in 106 of those lessons, and discusses some issues concerning the use of ICT in classrooms.

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Introduction

ICT in Key Stage 3 music lessons

There would be little point in writing this article if there was anything esoteric about the use of ICT in Key Stage 3 music lessons, or if its effective use was already widespread. ICT, used well, promotes higher attainment in music, although Rogers (1997) reported that it took time for some improved teaching styles brought about by increased provision of ICT to have a marked impact on pupils' attainment in music. The use of ICT in Key Stage 3 is a requirement of the National Curriculum for music in England: a requirement that is likely to become more pressing as technology develops, but which many schools find difficult to meet. Salaman (1997) reported examples of teachers using electronic keyboards during Key Stage 3 in a manner that is clearly not effective, a finding that is also supported by inspection evidence. There is also evidence that many teachers use ICT very rarely in Key Stage 3, or not at all. Many teachers obtained ICT equipment with Key Stage 4 pupils in mind, and are uncertain how to use it to promote musical learning with the generally larger and more mixed ability classes that they teach in Key Stage 3. Many computers languish beneath dustcovers during Key Stage 3 lessons. Many keyboards that are used simply as *electric pianos* have potentially valuable advanced features that are rarely utilised. The headphones that are associated with much of the music teaching that is supported by ICT transport pupils into a world where they could concentrate on their work, but sometimes do not.

This article forms part of OFSTED's commitment to *improvement through inspection*. It aims to disseminate some good practice in the use of ICT in Key Stage 3 music lessons, and is intended to help secondary music teachers who are planning how to improve their use of ICT to promote musical learning in their classrooms. It does not address questions such as which resources schools should purchase, or precisely what teaching methods

they should use. Rather, it shows, through examples, that there are several 'correct' answers to these questions, and that approaches which some teachers eschew may promote learning effectively in other hands.

We focus on the use of ICT in music lessons. However, while the use of ICT during Key Stage 3 is a requirement, and sometimes the most effective route to some specific musical learning, it is important to emphasise that much worthwhile learning in music takes place without the use of ICT. There is no expectation, nor would it be sensible, for music teachers to use ICT continuously during Key Stage 3. There are many aspects of the National Curriculum programme of study that can be taught effectively without the use of ICT, and some aspects which could not be taught through the use of ICT alone, as pupils in Key Stage 3, like pupils in Key Stages 1 and 2, also need to use and listen to acoustic instruments and the voice.

What is good music teaching?

This article is concerned with the use of ICT to support good music teaching. What is good music teaching? The *Framework for the Inspection of Schools* (OFSTED 1995) defines the quality of teaching in terms of its effect on pupils' attainment. Good teaching enables pupils to make good progress. The criteria that inspectors use when evaluating the quality with which a lesson is taught include the extent to which teachers:

- (a) have a secure knowledge and understanding of the subject matter they are teaching;
- (b) set high expectations so as to challenge pupils and deepen their knowledge and understanding;
- (c) plan effectively;
- (d) employ methods and organisational strategies which match curricular objectives and the needs of all pupils;
- (e) manage pupils well and achieve high standards of discipline;
- (f) use time and resources effectively.

Music teaching, whether or not it is supported by ICT resources, is judged by the extent to which it promotes progress in music. The teaching that is the focus of this report, i.e. good music teaching that is supported by ICT resources, also promotes good progress in music. The role of ICT in the lesson is in inspectors' minds as they evaluate the teaching against each of the criteria a–f, as is the role of any other resources that are in use, for example a whiteboard or acoustic instruments.

The schools visited

The sample of schools was drawn up by analysis of the inspection reports for individual schools, and by asking over forty music educators¹ to list some schools where they believed there was a likelihood that inspectors would encounter good music teaching supported by ICT resources in Key Stage 3. While this method of sampling was successful in producing a list of schools with a wide geographical spread, and a likelihood of good practice, it clearly could not hope to identify all the schools where practice is best. This article is concerned with good practice, not best practice. The schools that are named include some that

arguably could be numbered among the best schools for the use of ICT in Key Stage 3 music in the country, but others with similar qualities may have been omitted.

The fifty-two schools that were inspected are located in forty-five Local Education Authorities (LEAs) in a wide range of social settings. Most of the forty-nine maintained schools are LEA comprehensive mixed schools with an age range of eleven to sixteen or eleven to eighteen, but the sample also includes grant-maintained, denominational, selective and single-sex schools, and schools with other age ranges, for example nine to thirteen or thirteen to eighteen. Three of the schools are independent. The music teachers in the schools include a balance of men and women. Some of the music departments are equipped with a wide range of state-of-the-art resources: others were less well-equipped at the time of the inspection visit.

Inspection visits

All the fifty-two schools received a one-day inspection visit from one, or occasionally two, of the nineteen HM Inspectors or OFSTED-trained music inspectors who worked on this project. These visits took place between December 1997 and March 1998. The inspectors observed music lessons and activities, held discussions with key members of staff and pupils, and read documentation prepared by the school. When selecting the music lessons they would inspect, they chose Key Stage 3 in preference to other key stages, and lessons that used ICT in preference to those that did not.

Teaching and response in the schools visited

A total of 195 music lessons were inspected, of which 161 were in Key Stage 3 and made some use of ICT. Table 1 shows that the teaching in these 161 lessons compared well with music lessons nationally. This was particularly so in Year 9. In Year 7 and Year 8 the proportion of teaching that was *at least good* or *at least very good* was higher than usual. The inspection visits produced ample material for analysis of good practice: 106 Key Stage 3 music lessons with good or better teaching and use of ICT.

The inspection visits also produced examples of unsatisfactory practice in the use of ICT to support music teaching in Key Stage 3. In some cases this was because one music teacher in a department, not always an assistant teacher, used ICT less effectively. However, there were some other explanations. The presence of a dazzling array of ICT equipment in a music lesson is clearly not a guarantee of success: like all other resources ICT needs to be used effectively.

Table 1. Percentages of music lessons in Key Stage 3 with teaching graded satisfactory or better (1–4), good or better (1–3) or very good or better (1–2) in the inspection sample and nationally in 1997–98

	Y7 45 lessons			Y8 49 lessons			Y9 67 lessons		
	1–2	1–3	1–4	1–2	1–3	1–4	1–2	1–3	1–4
Sample %	29	62	87	25	61	84	21	54	93
National %	19	55	87	18	51	67	16	47	86

Table 2. Percentages of music lessons in Key Stage 3 with pupils' response graded satisfactory or better (1–4), good or better (1–3) or very good or better (1–2) in the inspection sample and nationally in 1997–98

	Y7 45 lessons			Y8 49 lessons			Y9 67 lessons		
	1–2	1–3	1–4	1–2	1–3	1–4	1–2	1–3	1–4
Sample %	29	64	87	30	70	88	28	64	92
National %	19	62	92	18	54	88	15	50	84

Table 2 shows that the pupils generally responded well to teaching that made use of ICT. Again, this was particularly so in Year 9. Comparison of Tables 1 and 2 shows that almost all the sample percentages that relate to response are higher than the corresponding percentages for teaching, a pattern which is less evident nationally. One must be cautious, because the sample is not large enough to support a robust analysis of correlations. However, it is possible that we are seeing here an effect of how ICT resources are increasing pupils' motivation beyond that which is simply a result of good teaching.

The 106 good lessons

Characteristics of the good teaching observed

What were the characteristics of the good or better teaching observed in 106 Key Stage 3 music lessons that were supported by ICT? Analysis of inspectors' writing shows that the lessons shared the following qualities:

- The teacher set a good example to pupils, encouraging them to take music, and the use of ICT in music, seriously;
- The teacher was knowledgeable about the resources in use;
- The teacher had thought about how the resources would be used to promote progress in music;
- The teacher organised the resources so that pupils' time was used efficiently;
- The teacher organised the lesson so that pupils' time was used effectively;
- The teacher encouraged pupils to use their initiative, and to think about what they were doing;
- The lesson was clearly a music lesson.

These qualities are expanded, and illustrated with some examples, below. Some of the points made are illustrated with brief references to good teaching in a lesson in a school. Some of these examples are in the main text; others are presented separately. There are also some references to teaching that was not good, indeed was not satisfactory, but from which teachers may find that they can learn. These are headed 'pitfalls'.

The teacher set a good example to pupils, encouraging them to take music, and the use of ICT in music, seriously

Teachers communicated, through their body language as well as through what they said, that music is something they enjoy and are enthusiastic about, and which they want to share with pupils. The teachers composed and performed during the lessons, usually working alongside pupils as fellow musicians to improve understanding and the quality of their work, and used the ICT resources with the same facility, and same sense of musical purpose, as they, or others, might use a piano or violin.

Pupils in Year 9 at Queen Elizabeth High School worked on compositions that used voice and acoustic instruments alongside their own computer backing tracks. They used software written by their teacher to edit their tracks by moving, cutting, copying and overlaying blocks of sound. The teacher worked alongside the pupils as a musician. He sang, played, made suggestions and asked questions that helped pupils continually to raise their musical sights. The pupils caught the teacher's enthusiasm, and his very high expectations concerning the musical quality of his and their work.

The teacher was knowledgeable about the resources in use

The teachers might not have known every last detail of all the functions of their most complex or recently acquired resources, but they had thorough knowledge of all the functions that pupils were to use. They gave detailed instruction concerning the use of specific functions when this was needed, but also had the confidence to let pupils find and undertake functions for themselves, for example cutting and pasting when sequencing. When problems occurred, they could troubleshoot effectively, with minimal disruption to the musical flow of the lesson and pupils' work.

The teachers had devoted a considerable amount of time to acquiring this knowledge. They frequently familiarised themselves with new resources by setting themselves a musical task: a backing track for a song to be sung in class, for example. When teaching pupils to use resources, they set them musical tasks to complete:

A teacher at Huntington School demonstrated sequencing on a keyboard to a Year 7 class, stopping periodically to ask pupils to analyse the musical effect of her actions, and make adventurous suggestions about how her developing composition could be improved. She explained that pupils would draw on their skill in sequencing throughout their time at school, for example in their music GCSE coursework. The pupils asked questions that developed their understanding, for example: 'Will it all come out on the same instrument?' 'If anyone talks will it be heard?'

Pupils in Year 9 at Mount Carmel RC Girls' School learnt how to multi-track in a context that was clearly musical, by developing a composition track by track. They were expected to decide what action they would take, musically and technologically, and evaluate the success of their work.

Teachers were knowledgeable also about the musical applications of the resources, their weaknesses as well as strengths, and frequently used well-chosen examples of commercial recordings or their own compositions to raise the musical expectations of pupils.

A Year 8 lesson at Robertsbridge Community College focused on the sound track to *Waterworld*. The pupils learnt to play a melody on keyboards, and then used the transpose facility as they

played it with the sound track. Next, the pupils gave their full attention to the film, which was replayed on wide-screen TV with quad surround sound. Focused questioning by the teacher kept the pupils listening to the sound track as they watched the film, and helped them to think about the relationship between what they were seeing and the sound track. They evaluated the effect of particular voices, background sounds, sound effects, changes in mood, and panning front to back, for example. The teacher shared his knowledge about some of the technical aspects of adding music to film.

The teacher had thought about how the resources would be used to promote progress in music

The teachers planned lessons with a view to what the pupils would learn, rather than simply what pupils would do. They disclosed their objectives for lessons and sequences of lessons to pupils, and explained how the use of ICT would facilitate their progress.

ICT was used for a musical purpose, and not as an end in itself. Pupils learnt new functions or skills, for example keyboard skills, so that they could apply them in their performances and compositions. As they learnt and applied functions they used their ears to appraise the musical effect of what they were doing. ICT was not allowed to take over the role of the teacher, who was continually monitoring what was happening, suggesting a different fingering pattern here, or more focused listening there, in order to help pupils raise their attainment, and raise their expectations of their attainment.

Pupils in Year 7 at St Saviour's and St Olave's School needed to learn how to add a right-hand melody to a left-hand chord sequence, so that they could apply this skill in their performing and composing. The teacher used a keyboard lab and a unit from a published keyboard course. She monitored pupils' work and provided individual support, and they asked her focused and relevant questions, stayed on task, and made noticeable progress during the lesson.

ICT was sometimes used to automate a performance, or one or more voices within a performance. Where this happened effectively, it turned the musical roles of teachers and pupils into something that they found manageable. A teacher who used a backing track to accompany class singing became free to monitor and develop pupils' work, and could transpose a tricky accompaniment into any key, to suit the range of pupils' voices. A pupil who sequenced an ostinato could concentrate on improvising a melody that fitted, in the knowledge that the ostinato was being played 'correctly', and could delay the challenge of playing both hands together until the melody was secure. Teachers were careful not to lose sight of the fact that music is a human activity. Occasions when pupils listened to a performance or composition that had been sequenced were always associated with analysis of the structure of the music, of which features worked musically and which did not, and why not, and of what should be done next to promote progress.

The teachers were aware that at times ICT might impede pupils' work. They used ICT as and when appropriate, as a way of extending and enhancing the music-making that they and the pupils shared. They set a balance between encouraging pupils to try out the different possibilities of equipment, and restricting their options, to avoid time-consuming and aimless scrolling through sounds, effects or values. When appropriate, they prepared template songfiles that supported learning, thus helping pupils to avoid functions they did not need, and steering them away from continuous use of default settings. They pointed

out to pupils when something could be done more easily, or to a higher standard, on an acoustic instrument. They drew pupils into the debate about when ICT helped and when it did not, for example using plenaries to draw pupils' attention to the strengths and weaknesses of different workstations.

The teacher organised the resources so that pupils' time was used efficiently

The pupils did not join a queue to collect keyboards stacked in a distant cupboard. In most lessons the teacher, sometimes supported by a technician or a pupil, had arranged the resources in advance, so that they were ready to be used. The teachers organised their classrooms and their storage space so that setting out the resources used relatively little of their time, and used trolleys for heavy equipment, and resources that need to be moved frequently. When pupils collected some of their own resources, this was done using routines that were well known, founded on common sense, and safe.

Teachers thought carefully about how best to use resources that were limited in number. In some projects, a rota that allocated each group access to a workstation for one week in a project that lasted several weeks worked well. More usually, teachers were concerned that this system would lead to disruption of work being developed using acoustic resources, and preferred a more flexible arrangement, or allocated one group of pupils to a workstation for an entire project.

Table 3

GOOD TEACHING USING ICT

+ The teacher started the lesson by improvising a *stampede* that was musically exciting, and had a sense of mystery.

+ When evaluating their work, pupils made a clear distinction between their competence operating the music technology and the musical effectiveness with which they had used it.

+ The teacher pulled together the threads of the lesson at the end, and pointed out the relative merits as sequencers of the computers and keyboards that pupils had used.

+ The pupils rose to the challenge of being expected to play the melody and accompaniment live, and found that working through the teacher's *assessment levels* helped them to achieve this.

+ A Year 7 class at Therfield School listened to the second movement of Dvořák's *New World Symphony*, and then learnt to play the opening

melody on keyboards. They tackled some relatively difficult keyboard fingering because of their very strong wish to be able to play the melody in question.

+ The lesson opened with revision of a song: the teacher used a computer backing track to free her to work more closely on encouraging expressive singing.

+ At Ifield Community College the teacher used a looped backing track to accompany pupils in Year 8 as they improvised pentatonically on the *black keys*. This freed him to clap rhythms, improvise vocally, move round the class to help pupils and assess their work, and give instructions.

+ The practical tasks that followed were *stepped* with care, and involved the use of a template songfile that helped pupils to focus on the task and make progress.

+ Pupils in Year 9 at The Cathedral School were composing music to accompany an

extract of film. Those using sequencing software found it easier to produce ideas that were more imaginative and varied, and made particularly good progress.

+ The boys and girls used the computers equally well. The teacher finds that it helps to ask for 'girls around the computer first'. Otherwise, they hang back and do not play an equal part in the lesson.

+ Everyone contributed ideas and music to a plenary session held at the end of the lesson.

+ A strength of this lesson was the careful attention that pupils gave to individual timbres, and each other's ideas.

+ Pupils in Year 8 at Guiseley School used keyboards and computers when composing imaginative pieces inspired by one of Satie's *Gymnopedies*.

+ They chose one of four given three-note patterns, and used *repetition*, *inversion*, *retrograde motion* and *xtension* to develop it into a phrase.

+ The teacher was content for the pupils to *break his rules* because the process they were going through was clearly musical.

+ The teacher expected pupils to plan their fingering, and to try to place their rhythms so accurately that *quantizing* would not be necessary.

+ They used techniques such as silencing tracks, adding parts and changing tempo when making their arrangements, and also as an aid to rehearsal when acoustic instruments, mainly tuned percussion, flutes and recorders, were added. They used singing to help them find the right note when transferring the round to an instrument.

+ Pupils in Year 9 at The Ellowes Hall School used a template songfile when they revisited, and later refined, the blues compositions that they had improvised live on keyboards.

+ The teacher increased the challenge by expecting some pupils to drop some of the auto features, but still produce a performance that was fluent.

+ Pupils in Year 9 at The Meridian School listened to some recorded African call-and-response and then composed their own in pairs at keyboards. They searched for some convincing drum sounds, and experimented with responses that imitated, inverted or varied a call. Their expectations concerning the overall balance of a call-and-response increased as the lesson progressed, and they listened carefully to their work as it developed.

+ Pupils in Year 9 at St Thomas More RC School were using software to create a twelve-bar sequence, bars, chords and improvised melody line using a blues scale. The pupils relished the independence afforded by access to twelve computer workstations, and worked very hard.

+ A group with a member who had succumbed to 'flu sequenced her part, so that they could continue to develop their work in her absence.

+ Pupils in Year 8 at Robertsbridge Community College listened to All Saints singing *Never Ever*.

They moved their chairs, to make the most of the quad surround sound. The teacher expected the pupils to listen closely to the music, to get behind the words. He played them some well-chosen excerpts, for example of the guitar wow-wow, asked them questions that helped them focus their listening, and built on their responses. Some pupils spotted wrong notes that had not been edited out. In other words, they were working beyond the expectations of the recording producer.

PITFALLS

- The pupils had used ICT resources, mainly sequencing keyboards, freely in music lessons since they entered the school. However, the music teacher who was enthusiastic about ICT had left, and a new one had been appointed. After a few weeks of a diet consisting entirely of singing, he turned to instrumental work, and decided to make use of the keyboards. First, he taught the pupils how to collect the keyboards from the store-room. He did not enquire how the pupils were accustomed to collect the keyboards, but introduced his own routine which had precision reminiscent of military drill, and did not allow the pupils to draw on their previous experience or use their common sense. It took a long time for the pupils to understand the teacher's complex rules and relearn how to collect the keyboards from the store-room, so long that by the time the keyboards were all out it was time for them to be put away again, and not a note was played.
- The backing track used during the choir rehearsal had been set up by another teacher, and the conductor did not know what to do when some unexpected squeaky timbres emerged.
- The assistant teacher did not fully understand the lesson plan prepared by the Head of Department, and there were also several computer breakdowns. Nevertheless, there was some useful discussion before the computer finally froze, for example 'should we use D, Dmin or Dmin7 here?'
- The teachers and the pupils always referred to 'this or that track', and were not learning terms such as 'part', 'bass', or 'ostinato'.
- This bottom band class had been set exactly the same task as the top band. They coped well musically, but the technology got in the way.
- The teacher had set up a sound template, to speed Year 7 pupils' choices of sounds – but they found the range of sounds available too limited, and became frustrated.

- The pupils played along with a sequenced version of a pentatonic march. The teacher gave them no opportunity to use their imagination, and more able pupils were not stretched.
- An ICT group worked on the same musical task as the acoustic groups, but took much longer to make progress. The pupils using acoustic instruments shared their musical ideas directly, by playing or singing them: those working round the computer shared their ideas via the mouse and the software, which was a much slower process.
- The pupils lost their sequenced work on keyboards at the end of each lesson.
- The keyboards lost their sequenced work if they were not touched for ten minutes: some work was lost before it could be heard during end-of-lesson plenaries, and all the work was lost at the end of each lesson. The pupils found it hard to recapture lost sequenced work, possibly because they could not draw on the visual cues available when they worked as an ensemble on acoustic instruments.
- The pupils worked in groups of four at workstations. The task was too demanding for many of the less able pupils. The teacher was unable to provide all the support they needed, and the lesson gradually lost pace.
- The pupils played layers of ostinati on classroom percussion instruments, and the teacher added his layer using the computer. The teacher had not considered the possibility of pupils' analysing his contribution – or even getting a chance to use the computer themselves.
- The pupils spent the entire lesson learning to play a short piece in C major on the keyboards. The headphones concealed a multitude of sins, and at no point in the lesson were pupils encouraged to use their imagination.
- The pupils were being taught to use the equipment. The teacher intended that the

musical use of the equipment would follow later.

– Keyboards that were not touch-sensitive hindered two groups: the sounds chosen decayed quickly, and the pupils did not notice that their treble and bass parts harmonised poorly.

– The interludes that pupils improvised for the class rondo could not be heard because everyone had their keyboards set to the default voice.

– When the pupils achieved some success, they tended to repeat the motif they had mastered, instead of taking the risk of trying something new. Sounds were treated as beeps from the computer, and were not explored in a musical context. The teacher's expectations of the pupils were musical, but obstructed by the technical difficulty and unmusical structure of the program. The pupils battled on, but were motivated by the challenge of mastering the program, rather than the musical qualities of their work.

– The teacher's software did not loop properly, and so the ostinato was interspersed with silences of indeterminate length. The group using acoustic instruments made faster progress.

– The larger boys tried to finger their chords on keyboards with medium-sized keys, but became frustrated. The group using a piano made faster progress.

– The teacher encouraged the pupils to finger the chords, but they continued to use single-finger chords.

– The Year 9 pupils were clearly bored by the keyboards. They told the inspector that they could not remember when they had last used an instrument other than a keyboard. They had ceased bothering to choose a voice appropriate to the task in hand: everyone was using the piano default voice to play through *Rock Around the Clock*.

– Many of the pupils drifted off task during twenty minutes of paired work and spent most of the time silently setting off demos and rock accompaniments, playing anything, or sitting doing nothing.

– Groups of pupils used a CD-ROM to sequence some recorded patterns. They became uncooperative when asked to appraise their work. The ICT produced convincing music for them with very little trouble, and their commitment to the lesson was low.

– The pupils played their keyboards at random as their interest in playing a pentatonic march waned.

Some teachers coped commendably with the challenges of working in some classrooms that were particularly under-resourced:

This classroom at Bramhall High School was set out and equipped in a manner that was less than ideal: there was only one keyboard between two, and everyone had to use headphones. The teacher worked around these constraints. The task he set was challenging, and produced compositions that needed to be performed by two pupils. He drew the Year 7 class together frequently to refocus their attention and help to avoid off-task activity that was hidden by headphones. The pupils successfully completed the task set: melody/ostinato duets in ternary form with an 'uncomfortable' bi-tonal B section. The lesson ended with a corporate, clearly musical, activity: singing accompanied by a lively backing track that had been downloaded from the Internet, and transposed for the pupils' vocal comfort.

The teacher organised the lesson so that pupils' time was used effectively

Lessons had been planned thoroughly, but with sufficient flexibility to allow teachers to capitalise upon particularly promising examples of pupils' work, and use them to inspire others. Teachers had good knowledge of pupils' attainment in music and more generally, and had decided how they would present tasks to help individuals make progress in music. They had thought about how pupils would be grouped for the tasks in hand, in order to promote learning. Any worksheets had been designed carefully, with clear steps and extension tasks. There were printed instructions available to help pupils who were using equipment with which they were unfamiliar.

Lessons started as soon as pupils entered the room. Clear expositions at the beginning of the lesson helped to avoid the need for troubleshooting at a later stage. Practical work was halted, when appropriate, so that the teacher could summarise and consolidate learning. Any sharing of work was allocated sufficient time to allow meaningful discussion, evaluation and assessment, with good involvement of pupils who were in the 'audience' for this part of the lesson. Lessons were drawn to a purposeful conclusion: they did not simply end with the bell. Any homework tasks were often set at the beginnings of lessons, in order to ensure that pupils could seek any clarification they needed, and lessons could end cleanly and on time.

Towards the end of a lesson at Huntington School, the groups of Year 8 pupils returned to the music room with their keyboards and guitars to perform their compositions, which were in ternary form with a drone, for assessment by the teacher, and diagnostic comment from the class. The assessment session had pace, but was not rushed. There was plenty of time for suggestions from pupils about each of the compositions, including the most effective ones, and the ones that were performed close to the end of the lesson. It was clear, from the teacher's body language, that he was giving performances and suggestions his full and critical attention, and the pupils responded with concentration and a very high level of engagement.

The teacher encouraged pupils to use their initiative, and to think about what they were doing

The teachers expected pupils to learn to become more autonomous as musicians. This was signalled through classroom routines, such as expecting pupils to switch on and off their own keyboards. Pupils were expected to listen carefully to and appraise their work, evaluate the effectiveness of the ICT resources in use, and pick up and use the musical vocabulary of the teacher, for example 'drum pattern', 'ostinato', 'balance', 'synchronisation'. They were also expected to think through the consequences of their artistic decision-making, for example by using sequencers to try out and appraise different options before making a recording.

Pupils came to music lessons expecting to be challenged. The teachers had established an atmosphere in which pupils felt able to try out their ideas, rehearse, and learn from their mistakes. The fostering of independence usually meant that teachers could work effectively between two or more rooms, in the knowledge that pupils would remain on task, and would use strategies to try to solve their own musical problems.

The lesson was clearly a music lesson

These lessons all took place so that pupils could make progress in music. The pupils worked as musicians – composing, performing, listening and appraising – and used their imagination and developing musical judgement as they were challenged to raise the quality of their work. The role of the ICT was simply that of facilitating progress in music.

The ambience of the spaces in which pupils worked signalled their musical function. Many of the schools had accommodation for music that fell far short of ideal with respect to quantity and condition. However, the teachers used display and layout, lighting and acoustics, to establish an atmosphere appropriate to the creation of music. Some teachers had tried to create something that looked like a professional studio: others preferred a more institutional flavour. But no matter how many monitors, headsets and leads were on display in these rooms, the medium in which teachers and pupils worked was sound.

A Year 8 class at The Four Dwellings School entered the music room as a recording of the slow movement from Beethoven's Seventh Symphony was played. The teacher drew the pupils' attention to the rhythmic ostinato, and then used this to underpin a funeral march that was improvised by the whole class, and lasted for over five minutes. The ostinato was played throughout on bass drum by a pupil. Initially, he played *pianissimo*. The teacher and trainee teacher added drones and melodic ostinati from a keyboard and a computer. There was a slow natural crescendo as each pupil was given a percussion instrument for improvisation, followed by a natural diminuendo as the instruments were collected in. Eventually, all that was left was the original ostinato, again played *pianissimo*. The pupils focused in total silence as even this sound died away.

ICT adding value to pupils' motivation and progress

Inspectors were asked to comment on the use of ICT to:

- (a) enable attainment in music;
- (b) enhance progress; or
- (c) increase pupils' motivation.

Clearly, there were lessons and schools where the use of ICT did not add value, usually because the teaching was unsatisfactory, or because ICT made a musical task more difficult and slower than it could have been with acoustic resources. However, inspectors observed many more constructive examples, of which some are referred to here.

ICT enabling attainment in music

Attainment was frequently enhanced by the use of sequenced backing tracks, often in template songfiles. Their total reliability left pupils free to concentrate on improvisation, or improving the accuracy and expression of a performance, without the disruption caused when live accompaniments go awry. Teachers used backing tracks skilfully to raise pupils' expectations as well as attainment, gradually increasing their tempo as vocal or instrumental performances became more fluent, or transposing them, for example to fit pupils' singing voices more comfortably. Questioning was used to deepen pupils' understanding

of the structural relationship between the line they were playing, and the backing. In some projects, a backing track was used during final performance. In such cases, teachers would expect pupils to control its tempo and dynamics, for example, with attention to detail that is not possible with live performers. In other projects, pupils were weaned off backing tracks as their performances and compositions became more secure, with higher attaining pupils usually weaned earlier. This provided a context in which pupils could consider the relative merits of sequenced and live performances, the role of 'live feel' in adding quality to musical expression, and the techniques that live performers must use to play with good ensemble.

More generally, the ICT raised attainment through the wide range of possibilities that it offered to composers. Pupils were not limited to compositions that they could play reliably themselves, remember or notate. They could build up compositions from layers of keyboard parts that they had input in real time, but could not have hoped to play together in real time. They could prefix a composition over which they had laboured with a pre-set intro chosen with care. They could choose a keyboard backing for a song that they had composed by considering matters of style and effect, rather than whether they could play it or not. Some pupils used sequencing in combination with improvisation to push tonality to its boundaries, and beyond, and developed compositions that were stylistically consistent, but ambiguous tonally. Sequencers allowed pupils to produce compositions that verged on unplayable on acoustic resources:

A pupil in Year 7 at Hirst Park Middle School, Ashington, explored ascending and descending chromatic patterns as a means of building tension. He used a sequencer to maintain one part, and mirrored it in the part that he added live.

ICT enhancing pupils' progress

Sequencers were frequently used to promote progress in appraising. Teachers used the facility to silence or enhance tracks to enable pupils to isolate musical features that had previously been buried. Once they were certain that pupils had heard and understood the feature, the original balance could be gradually or immediately resumed, with pupils clear about what the teacher wanted them to hear. Sequencers also facilitated progress in composing. For example, they allowed pupils to experiment with different voices, melodies and expression before making a recording. The repeatability of sequencers meant that choices made by a group of composers could be shared with the rest of the class, some time after it had been made, if the teacher judged that this would enhance progress more generally.

A listening experience of music of particularly high quality could be used to trigger progress later in a lesson:

At Robertsbridge Community College, East Sussex, the teacher used quad surround sound to play Robert Miles's *In My Dreams* to pupils in Year 7. He then gave them an eight-bar extract in four-part open score, and explained that he wanted each pupil to try to play as many of the parts together as possible. After some whole-class tuition in the individual lines, the pupils started to work on their own. By the end of the lesson, some of them were playing three parts together – two in the right hand and one in the left.

The use of samplers gave pupils the opportunity to use sounds that they had performed and creatively altered:

Pupils in a Year 8 class at Plumstead Manor School were composing variations of *Frère Jacques*. During the lesson observed, one group of pupils had their turn at using a set of equipment consisting of a sampler, microphone, portable multi-track recorder and keyboard. The teacher expected them to sample all or part of the theme, and replay the sample using keyboard triggers at different speeds and pitches. The resulting effects were to be treated as creative material that could be incorporated into one or more variations, and not as ends in themselves. The pupils experimented with different recording levels and lengths of sample, and made several attempts at sampling before they were satisfied with what they had produced. They were fascinated by the range of the creative material that they could produce by triggering, and thought carefully about its structural and expressive potential.

On a more pragmatic level, ICT sometimes allowed pupils to complete a given task in a shorter time. It also permitted them to continue to make progress with a performance or composition project when a member of their group fell ill: their part was sequenced, and if appropriate developed and improved in their absence.

ICT increasing pupils' motivation

The effect of ICT on pupils' motivation was often almost tangible. Computer backings with a professional sound quality encouraged singing that was enthusiastic and expressive in a range of moods, and which pupils wanted to improve further when they reflected on their recordings. The skilful use of quad surround sound, including the teacher's careful choice of short excerpts, motivated pupils to listen to commercial recordings in detail. Pupils returned to the music room at lunchtime or after school to continue their work. Sometimes the work that they produced on these occasions was particularly worthwhile:

At The Canterbury High School two boys in Year 9 had produced a sophisticated work in six to eight parts, and over 100 bars long, with a range of well selected effects. Their composition was developmentally and stylistically consistent, showed secure understanding of harmonic principles, and exploited percussion sounds that had been put together from a range of sources. The boys planned to continue music in Year 10, and their composition already had the quality required to trigger a high grade at GCSE.

Pupils' views

Pupils, almost without exception, were enthusiastic about using ICT in music lessons. Some asked their parents to purchase keyboards for use at home, and enjoyed practising the materials they learned in their music lessons. Some schools had materials that pupils could borrow for use at home, and pupils spent much of their own time consolidating work introduced in music lessons. Sometimes the musical traffic flowed from the home to the school. Pupils at a school where ICT had been introduced recently commented favourably that music lessons at school now allowed them to do the musical activities that they had previously undertaken only at home.

Some pupils at schools that had used ICT for several years found it difficult to

comment on its benefits, because they could not imagine music lessons without access to it. Other pupils found it difficult to explain why ICT was so appealing:

I just like keyboards because you can get a good tune.

Pupils at Sir John Talbot's School were particularly articulate about the strengths and weaknesses of ICT. They liked using computers for:

- repeatability: they can repeat their developing work reliably while new melodies and chords are tried against it. They can edit their work until it is accurate. They can listen to and evaluate their sequenced work without simultaneously having to perform it;
- multi-tracking: they enjoy layering sounds, more sounds than they can play themselves on a normal keyboard;
- the ease with which changes (tempo, pitch, timbre) can be made, tried, discarded, retained: 'You don't need a rubber'.

Pupils disliked:

- losing a file or track;
- waiting while a keyboard or computer malfunction is sorted out;
- the sometimes impersonal nature of synthesised sound.

Some pupils who are learning to play orchestral instruments disliked:

- keyboards. For performance they prefer their own instruments, but acknowledged the benefits of ICT for some composing projects.

Pupils at Archbishop Grimshaw RC School liked computers for the following reasons:

- the variety of sounds that can be used:
 - * unusual sounding voices on keyboards;
 - * music that is too difficult for pupils to play live.
- the improvement in presentation that a computer can give, including quantizing;

They disliked it when:

- you lose something you've recorded;
- 'it's hard to get your fingers round the notes you want' (a guitarist).

Issues for schools to consider

As secondary teachers reflect on, and consider how to develop, their department's use of ICT to promote musical learning in Key Stage 3, they may find it helpful to address the following issues:

ICT in Key Stage 3 music lessons now

For example:

- To what extent do music lessons that employ ICT share the characteristics of the good lessons inspected?

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- Is the range of ICT being used narrow (perhaps confined to sequencing), and if so is this adversely affecting pupils' learning?

Personal professional development

For example:

- Do teachers need more knowledge, perhaps about the Internet or sound processing?
- Where can this knowledge be obtained (perhaps through reading, attending training, or visiting other schools)?

ICT in music lessons from the point of view of the school

For example:

- Do senior managers value the use of ICT in music lessons, and understand how it can promote musical learning?
- What are the relationships between ICT in music lessons and the IT curriculum?

ICT in music lessons from the point of view of the pupils

For example:

- How many different ICT systems are pupils learning to manage at school, and also at home?
- Are these giving useful breadth to pupils' ICT experience, or confusing them and constraining their learning?
- Are there some music resources on the school website that pupils can use?

Planning for the future

For example:

- How will teachers learn about new developments in ICT as they arise?
- Has the school planned to replace ICT equipment that will become obsolete?
- Is there a strategy for developing skills alongside any new equipment to be purchased?

The *Training Guide in Music Technology in Action* (BECTa 1998) provides further insights into many of these issues.

ICT: some terminology explained

This section of the article explains some of the ICT terms used earlier and illustrates them with further examples of good teaching. Comments that relate to particular ICT applications have been loosely grouped together.

It is noticeable that in the 106 good lessons observed some technologies were used much more frequently. Electronic keyboards and sequencing were used in most of the lessons, audio recording/playback and sound processing were used in some of them, and

the Internet and CD ROM were barely used at all. The fifty-two schools in the sample were not chosen to be representative of current national practice concerning use of ICT in music teaching, but it would not be surprising if this bias indeed reflected a national tendency.

It does not follow that the less favoured applications are inherently of lower value in music education. Teachers may just be making efficient use of the technologies that are already available to them. It may be the case that all the technologies have potential that is under-developed at present in many schools.

At the time of writing, many teachers in the wider population still have no personal experience of using some areas of ICT for music teaching. For some, music ICT is perceived as limited to MIDI sequencing. A sequencer can indeed be a potent learning tool when used wisely. But because of the relative complexity of typical software, some teachers delay the use of sequencing until pupils have embarked on GCSE courses. This often means that useful foundation work done with ICT while pupils were in Key Stage 2 is not built on during Key Stage 3.

The music section of *A Review of Software for Curriculum Use* (NCET, 1997a) reports that:

too much software in use in this key stage [Key Stage 3] was conceived as more elaborate software designed for an older audience, with features simply cut back in order to extend the marketing potential to this lower age group.

This situation presents a significant challenge to teachers, which BECTa's *Music Technology in Action* training materials are designed to help them overcome by:

- providing a structured programme for acquisition of sequencing skills likely to be needed in Key Stage 3; and
- broadening their awareness of other relevant ICT applications such as electronic keyboards, CD-ROM and audio recording and processing. Guide 1 of *The Music IT Pack* (NCET, 1997b) also suggests ways in which a range of technologies might support musical learning in Key Stage 3. These two resource packs for music teachers focus on educational issues and do not attempt to burden teachers with esoteric matters. The technical advice included is limited to that which teachers might need to know to manage learning effectively.

Computers sometimes fail teachers. Pupils reported their dislike of malfunctions and of work being lost. Teachers sometimes feel inadequate if they are unable to solve technical problems by themselves. One of the characteristics of good teaching that has emerged from these inspections is that the teacher was knowledgeable about the resources in use. This should be taken in an educational context rather than a technical one. Teachers can only be expected to know about resources that are working as intended and the simplest of troubleshooting strategies. Serious malfunctions and certain types of maintenance are a matter for technicians not for teachers, particularly as there is such a wide range of technologies that can be used in the music classroom.

Pupils in Year 9 at The Ellowes Hall School used a template songfile when they revisited, and later refined, the blues compositions that they had improvised live on keyboards.

A teacher at St Peter's CE High School used a large screen display to show a class of Year 9 pupils how to edit a drum part. The practical tasks that followed were stepped with care, and

involved the use of a template songfile that helped pupils to focus on the task and make progress. The teacher expected pupils to produce work that sounded effective, and they responded well to this challenge. They were proud of their work, and eager to save it so that they could develop it further in the next lesson.

A template songfile is a sequencer data file that has been prepared to make a musical task technically more straightforward for pupils by offering a convenient starting point for further work. Paradoxically, although described as a 'songfile', it need not relate to a vocal piece. A template songfile will often contain incomplete musical material that is to be refined by pupils, or which is to be used as an accompaniment while further ideas are added. It often also contains empty tracks that are already set to produce a particular timbre, volume, transpose level, octave transposition, quantize, etc. These prepared tracks are then ready for immediate use by pupils and can shield them from the sometimes very technical business of setting up new tracks from scratch, which may have little bearing on the educational concept under investigation. In the lesson at St Peter's CE High School, for example, the teacher had prepared his own template songfile with drum edit settings designed to allow more straightforward pupil interaction with percussion parts. Producing template songfiles does require a certain level of technical understanding and familiarity with sequencer operation, but some are commercially available.

The progressive training activities in the MIDI Sequencing component of *Music Technology in Action* are all based on supplied template songfiles.

A good quality screen large enough for clear display to a whole class is currently a rare and expensive commodity. Manufacturers have now realised how valuable an asset a large screen display would be to a classroom. Competition is already beginning to drive prices of screen projectors down, but costs are likely to be prohibitive for typical departments for some time to come. Teachers may be able to draw from whole school funding where this is available. There are those who predict that large 'smart screens' will eventually replace whiteboards and blackboards and become a standard feature of every classroom. In the meantime, it may be possible to make other arrangements to ensure that all pupils have a clear view when the teacher wishes to give a class demonstration:

- a special OHP panel is a little cheaper than a screen projector;
- a single large screen TV is even more affordable, but not as clear;
- two or three TVs can be positioned strategically around the room and made to show the same picture;
- where a network of computers already exists, it is possible to make every screen show the same picture.

All these possibilities will need to be discussed with a technical IT manager, as they all require special equipment or software. Where none of these is possible, any attempt to demonstrate fine operational detail to a whole class using a single small screen may be unsuccessful. Situations that require the use of ears more than eyes are more likely to succeed in these circumstances.

At Ifield Community College the teacher used a looped backing track to accompany pupils in Year 8 as they improvised pentatonically on the black keys. This freed him to clap rhythms, improvise vocally, move round the class to help pupils and assess their work, and give instructions.

Preparation of a template songfile is an ideal way to provide a backing track over which pupils can practise, and eventually record, improvisations of any sort. Advantages include that:

- pupils have untiring access to as many repetitions as they might require for practice;
- the teacher is free to focus on listening to what pupils are playing rather than performing as an accompanist;
- a good backing track can sound stylistically authentic, which can also motivate pupils.

A Year 7 lesson at Hirst Park Middle School was part of a unit on *Scales and Patterns*. It opened with a round sung in C major in two parts over a sung tonic–dominant ostinato. After some brief revision of the scale of C major, and how it appears in staff notation, the class divided into groups to arrange the round. Some of them used sequencing keyboards, and others used software with a template songfile. They used techniques such as silencing tracks, adding parts and changing tempo when making their arrangements, and also as an aid to rehearsal when acoustic instruments, mainly tuned percussion, flutes and recorders, were added. They used singing to help them find the right note when transferring the round to an instrument. Staff notation was treated as an *aide-mémoire*, as a means of clarifying or remembering music learnt by rote. The lesson ended with round being sung again, this time in three parts over the ostinato. The pupils showed enjoyment in working out how the parts fitted together.

This lesson provides a very practical example of the type of sequencing activity suitable for younger pupils because it begins with the material already sequenced and allows pupils to make musical decisions about its arrangement through operations that are relatively simple to carry out. Even at the most basic level of operating skill, accompaniments can be shaped by simply ‘muting out’ chosen strands of the texture at certain points. The same technique can often be helpful when using a sequencer to support rehearsal.

A round is also a fertile form for exploration by inexperienced software sequencer users because it can be built up by delaying the entry points to existing melodic material: a procedure that requires no new recording.

Pupils in a Year 8 class at The Wyvern Community School were learning ways of manipulating and extending basic melodic materials. During the lesson observed, they chose one of four given three-note patterns, and used *repetition*, *inversion*, *retrogradation* and *extension* to develop it into a phrase. By the end of the lesson, some pupils had also added an accompaniment. A later lesson would introduce other techniques for manipulating melodic material including cutting and pasting. The pupils worked in pairs. Some pairs chose to share a keyboard: others had individual keyboards. Two pairs used sequencing software, and carried out exactly the same task as their peers.

Turning a phrase upside down or reversing the order of notes is a simple transformation presenting no problem for a computer. Several music programs, including some intended for primary pupils, offer this facility through a single mouse-click. Some more advanced sequencing programs allow the user to define and store custom editing processes for future reuse, and these could be included in a template songfile.

With either type of program, pupils can invert or retrograde material very easily, freeing them to concentrate on the resulting sound rather than the mechanics of the transformation. It is sometimes possible to set up a ‘MIDI input transformation’ on a

sequencer to invert the normal keyboard layout so that high notes are found on the left and low notes on the right. Melodic patterns played on this keyboard will then sound ‘the other way up’ from normal. This can be quite disconcerting for an experienced player. They are not always simple for the teacher to set up, but pre-programmed operations like this can be provided for less able pupils and can make a task easier to achieve on the computer than when using standard keyboards.

Cutting and pasting is a technique used when working with all sorts of computer applications. It allows a user to change the position of a particular section of work or duplicate it.

Pupils in a Year 9 class at Woolston High School were continuing a project on composing dance music. They had used the composing software also in Year 7 and Year 8, and so could focus on the musical demands of the task in hand. The teacher expected the pupils to think carefully about how they wanted their composition to sound, and to revise it in the light of judgements made aurally. He also expected pupils to plan their fingering, and to try to place their rhythms so accurately that *quantizing* would not be necessary.

Quantizing is an editing procedure that can easily be carried out on a passage that has been recorded into a sequencer. The effect varies according to the ‘quantize value’ that is chosen. The sequencer calculates quantize points at regular rhythmic positions throughout the bar, according to the chosen quantize value, and the timing of notes is then altered so that each one begins exactly on the nearest quantize point. Quantizing a freely recorded performance therefore imposes mechanical timing precision and also sets the minimum rhythmic distance that can be heard between consecutive notes: semiquavers will not be heard if the quantize value is set to quavers.

Once users know about this facility there is a temptation to tolerate sloppy playing when recording, knowing that this can be corrected afterwards by quantizing. If timing is too loose, however, quantizing may result in notes being moved further away from their intended position because they were actually recorded as being closer to the earlier or later quantize point. Quantizing can also deprive a performance of some of its character. For example, spread chords and natural compensation for a sound with a gentle onset (slow attack) will be lost.

In many educational situations it will make sense to avoid quantizing altogether to encourage pupils to perform to the highest standard. However, those who find it impossible to perform with acceptable rhythmic precision will perhaps find some remedy in quantizing what they have played. A more sophisticated type of metric manipulation, known as ‘groove quantizing’, may possibly offer some potential when creating or investigating music in modern commercial styles.

This Year 7 lesson at Hirst Park Middle School also formed part of a unit of work on *Scales and Patterns*. The theme was Theseus and the Minotaur, a story pupils were reading with the same teacher during English. The lesson opened with revision of a song: the teacher used a computer backing track to free her to work more closely on encouraging expressive singing. Next, the class learnt how to read the melody of the song on-screen by following the cursor, and discussed the tense and dramatic mood created by this melody – which was based on a chromatic scale and had a jagged line. For the remainder of the lesson, the pupils continued work on the descriptive music that they were composing in groups or alone. They used their favourite scale:

C major, A minor, C chromatic, a blues scale, an Indian raga, or a pentatonic scale. They worked on keyboards and software, often in combination with acoustic instruments including flute, clarinet and tuned percussion. Vocabulary including 'drone', 'sequence', 'scale', 'chromatic', 'ascending' and 'descending' was used routinely and accurately by almost all the pupils. While everyone used ICT as an 'additional instrument', some pupils exploited its potential to increase the scope of their work. For example, a boy who was exploring ascending and descending chromatic patterns as a means of building tension used a sequencer to maintain one part, while mirroring it in live performance. Another boy began with a simple line recorded on one track, but by the end of the lesson had added three more parts (the final one involving some heavily syncopated chords), and was able to perform his piece to a high standard.

Some teachers do not favour use of the computer in singing activities, perhaps thinking that its sound is too synthetic to be allowed to intrude on such a natural activity. But the teacher in this case study does not use the computer to model the vocal performance. Instead she gets it to play a backing, which frees her from accompaniment duties to be able to focus on actually improving the quality of pupils' singing, which includes demonstrating with her own voice. With its wide selection of instrumental and percussion timbres, the computer can often provide an accompaniment that is more complete, authentic and stylistic sounding than would otherwise be possible.

Where learning a new song is not organized as a whole class activity, a MIDI version (or an audio recording) can at least offer a basic model of the melody. Pupils might be asked to identify ways of bringing expression to their performance if they learn a melody in this way.

Most programs that can show staff notation are also capable of moving a cursor (or time line) across it while it plays back. This can help to train the eye where music reading is insecure. It is also often possible to mute the part being traced, which offers an opportunity for pupils to add the missing part by singing or playing from the music.

Pupils in Year 8 at Millais School were learning to play a waltz on keyboards. This task was linked to three assessment levels. Pupils achieved Level 1 by playing the melody, Level 2 by sequencing the accompaniment and playing the melody live, and Level 3 by playing the whole waltz live. The pupils rose to the challenge of being expected to play the melody and accompaniment live, and found that working through the teacher's 'levels' helped them to achieve this. They were very familiar with the sequencing keyboards: all their questions to the teacher were about music.

The teacher here wanted to assess solo performing ability and so graded live playing of the whole waltz at a higher level than sequencing the accompaniment and playing just the melody live. Keeping good time while playing to a sequenced accompaniment requires ensemble performing skills that would not come into the other levels. The process of sequencing an accompaniment can also reveal to pupils certain aspects of the piece that may not become obvious while practising to give a solo live performance.

Pupils in a Year 9 class at Bramhall High School were in their third week of a project on song-writing. Groups had been advised to start with a bass and chords and then add a melody, and were given a range of strategies for developing a melody that *fits*, such as humming along with the bass and chords. All the groups were expected to finger their chords. Sequencing keyboards and one computer with sequencing software were used to allow step-time or below tempo

layering of compositions, and oiled the wheels for pupils without reliable keyboard skills. Pupils who were more competent performers, and who found that sequencers slowed their work, used multi-track recorders instead. One group, in their enthusiasm for the project, had started by composing a melody, to which they were now strongly committed. The teacher was content for them to break his rules because the process they were going through was clearly musical. He could give the group the extra support that they needed now that they were trying to find chords, because there was only one such group, and he could exploit this group's different pattern of work when, at the end of the project, he expected the class to reflect on the musical processes each group had used.

Step-time is very different from real-time. These terms describe different methods of creating a sequence. With step-time, there is no need to perform rhythmically. The user can move forward (and sometimes back) through the sequence, adding or subtracting notes at will. This is done either by regular time divisions (e.g. quaver steps), or by typing in the required rhythmic value of each note as it is entered. Sometimes lines representing the pitch and duration of each note can be 'painted' on to a grid. Step-time sequencing can be a practical approach for those whose level of keyboard skill would not allow them to perform the phrase reliably in real-time. Creating a rapid flurry of regular quavers is often very straightforward. However, it is much harder for pupils to re-create more complex imagined rhythms using step-time, as they need to have a very precise awareness of the starting point and relative duration of every note. In some cases it can also be difficult to achieve phrasing through varied articulation of notes.

In situations where the desired rhythm is complex, or where articulation is important, it often makes more sense to try to record the sequence in real-time (i.e. in true rhythm) but at a much slower tempo. After recording, the playback tempo of the sequence can be speeded up with no adverse effects.

Whenever an audio recording is being made (e.g. using a multi-track recorder), below tempo recording is an option only if the recorder has a 'varispeed' control. Even then, the tone quality will be affected when the recording is played back faster, and this is particularly noticeable with the human voice. Readers who have heard old recordings by 'Pinky and Perky' will understand the nature of the transformation. This effect is only occasionally desirable. Modern digital audio recorders are sometimes technically capable of increasing the tempo of a recording without affecting pitch or timbre, but this can be a more complex operation. Multi-track recorders are often a tool best offered to more competent performers.

Pupils in Year 8 at Bramhall High School were composing Raps in groups. The teacher wanted the pupils to work accurately, and to make very fine judgements about the balance and tempo that was most appropriate for their compositions. Each group produced a backing track that was reliable, by sequencing it on a keyboard or using software, and then worked around it using their voices and untuned percussion. Two groups with very able keyboard players ultimately dispensed with their sequenced backing tracks, and played live. A group with a member who had succumbed to 'flu sequenced her part, so that they could continue to develop their work in her absence.

The compositions being sequenced by pupils in Year 9 at The Gryphon School comprised a chord sequence, melody and bass riff. Pupils who were waiting to use a computer worked at sequencing keyboards for the first half hour. The teacher pulled together the threads of the

lesson at the end, and pointed out the relative merits, as sequencers, of the computers and keyboards that pupils had used.

Pupils in Year 9 at William Parker School are experienced users of sequencing keyboards, and the teacher was able to give her full attention to matters musical when groups and individuals composed marches in ternary form with an introduction. Everyone contributed ideas and music to a plenary session held at the end of the lesson.

Not all keyboards are capable of sequencing beyond the repetition of chosen preset drum patterns. Manufacturers started to put simple sequencers on keyboards in the 1980s, then for some time it seemed that they dropped the idea. However, keyboards with sequencing facilities are making something of a comeback and this is good news for music education. Keyboard sequencers are generally less versatile than computer-based MIDI sequencing software but, because of their relative simplicity, the business of sequencing on keyboards can be much more straightforward and immediate. Pupils using keyboards may need to think about balance while they are recording a sequence, as it cannot generally be altered afterwards. When using computer software, the balance between parts can nearly always be adjusted on reflection after the recording has been made. Another significant difference is that computer sequencer work can easily be saved to disk for future lessons, but work is generally lost once a keyboard has been switched off.

Working in pairs at keyboards, pupils in Year 7 at Presdales School were using an eight-line poem about winter as a stimulus for a composition that they would notate graphically. During the lesson observed, the third of four allocated to this project, there was a great deal of discussion between pupils, and between pupils and the teacher, about the sounds that were appropriate, and how they best could be used. 'How can I get an ice sound?' 'Shorter notes perhaps?' The pairs shared their ideas, talked about them using musical terminology, developed them, and then made informed choices. One pair chose a harp for snowflakes and high flute and piccolo for dazzling whiteness. A pair of pupils with learning difficulties discovered a glissando, became highly motivated by it, and planned exactly how they would play it to give the effect that they sought. A strength of this lesson was the careful attention that pupils gave to individual timbres and each other's ideas.

This kind of activity is likely to work best when pupils have access to a keyboard with a good variety of timbres. Some older keyboards have only a limited sound palette. Increasingly, modern keyboards come with a 'General MIDI' (GM) soundbank. This is a standard set of 128 sounds, including synthesizer and sound-effect timbres as well as instrument imitations. GM also specifies a standard range of percussion sounds. Whilst the GM standard specifies the nature and name of every sound, each manufacturer interprets the description in their own way. More advanced keyboards (and most synthesizers) allow the user to modify preset timbres or add processing effects such as chorus and reverberation. Some manufacturers' products are described as GS or XG and these are extensions to the GM standard. A keyboard with good quality sounds and amplification (or a good pair of headphones) will often motivate pupils simply because the sounds are a joy to listen to. Computer soundcards are often described as GM and those that use 'wavetable synthesis' will generally sound much more musical than those that use cheaper FM synthesis.

Pupils in Year 8 at Litherland High School devised an eight-chord sequence based on primary and secondary triads, sequenced it, and then improvised and sequenced a melody and a bass.

They adjusted the voices and balance until they seemed just right. The teacher then increased the challenge by expecting some pupils to drop some of the auto features, but still produce a performance that was fluent.

Keyboards and some computer programs have features that can produce relatively sophisticated musical results from simple operating actions. Single-finger chords, auto-accompaniment styles and melodic auto-harmonisation are common auto features. These can be a strong motivating factor and, used wisely, they allow pupils to explore creative decisions that they might not otherwise be able to understand. But they can also cloud assessment issues unless, as in this lesson, the teacher is careful to focus on true levels of skill and understanding. Teachers can promote progress by encouraging pupils to learn how to achieve things for themselves.

Most of the pairs of pupils in a Year 9 class at Presdales School were using keyboards to sequence music for an extract of a film: *The Lion King*. They had already divided the extract into sections that were timed precisely. The teacher started the lesson by improvising a stampede that was musically exciting, and had a sense of mystery. The pupils worked with pace and enthusiasm, and knew how to use the equipment available to do what they wanted. They timed their developing work precisely using their watches. They discussed their ideas using terminology including 'glissandi', 'minor', 'scale' and 'tempo', and also more informally, for example: 'I need a pattern that is fast and lively but not happy if you know what I mean'. Some pairs used more than one sound simultaneously, or allowed sounds to overlap: others worked monophonically. There was a particularly effective stampede that gathered in volume and tempo and was loudly applauded by all. A pair of pupils with learning difficulties used a CD-ROM with pre-set 'Africa' sounds to carry out the same musical task as their peers, and were pleased with the work they produced.

CD-ROMs can offer a range of educational opportunities. The one used in the lesson at Presdales School offers pupils a creative tool allowing short pre-recorded passages (here in an African style) to be assembled into a chosen order to give a musical core. A variety of short chants can then be added live by clicking their screen icons with the mouse, and tuned percussion notes can be 'played' from the QWERTY keyboard. Any performance can be recorded. The musical features on offer are quite similar to some of those on a sequencer, but this CD-ROM is more straightforward to use because it offers a limited number of actions.

Pupils in Year 9 at The Cathedral School were composing music to accompany an extract of film. Those using sequencing software found it easier to produce ideas that were more imaginative and varied, and made particularly good progress.

In a lesson at Robertsbridge Community College described earlier, pupils were appraising an existing film soundtrack. Pupils may often go on to compose their own soundtrack, as in the lesson described at The Cathedral School. Latest versions of many sequencers, often described as AV versions, allow them to be synchronized to a video playback window on the same computer screen. Video files can be very large and need to be accessed quickly and frequently by the computer. They usually need to be situated on the computer's internal hard drive and some older computers may not have sufficient space. Suitable clips can be downloaded from the Internet when computers are not equipped with video

capture cards. There is also at least one CD-ROM currently on the market that allows an audio soundtrack to be recorded to a given video clip at the click of a button.

The teacher played a CD of a Colombian song as a Year 9 class at The Four Dwellings School entered the music room. The song had a simple chord sequence which served as an example for the pupils' own song writing. In groups, pupils composed the bass line and chord sequence for their song, using a template songfile devised by the teacher. Some groups also started work on their melodies. The boys and girls used the computers equally well. The teacher finds that it helps to ask for 'girls around the computer first'. Otherwise, they hang back and do not play an equal part in the lesson.

Many music teachers do not appreciate that, as long-standing users of audio recordings in lessons, they could perhaps be counted among the earliest users of ICT in education. There is no reason why even old gramophone records should not continue to be used in the type of situation described in these lessons. More recent digital consumer audio formats such as CD, MiniDisk (MD) and computer-based applications that can directly index specific playback regions, can also offer precise access to particular sections of recordings, which may be useful in other educational contexts.

Pupils in Year 8 at Robertsbridge Community College listened to All Saints singing *Never Ever*. They moved their chairs, to make the most of the quad surround sound. The teacher expected the pupils to listen closely to the music, to get behind the words. He played them some well-chosen excerpts, for example of the guitar 'wow-wow', asked them questions that helped them focus their listening, and built on their responses. Some pupils spotted wrong notes that had not been edited out. In other words, they were working beyond the expectations of the recording producer.

'Wow-wow' (or 'wah-wah') is one of several processing effects that can be applied to a sound to change its expressive effect.

The principle of 'quadraphonic' sound reproduction was first developed some years ago. As its name suggests, sound comes from four loudspeakers positioned all around the listener. Each of the four channels is capable of playing a unique signal and it is possible to create the impression that a sound is positioned or moving anywhere in the listening space. A more recent variant called 'surround sound' has been developed mainly for use on cinema and video soundtracks. This is a special format with all the features of quadraphonic sound, but which is also compatible with playback on normal two-channel stereo systems. Conversely, the special amplifier needed to produce surround sound can automatically play back stereo recordings to give a basic impression of depth as well as width. The effect on pupils is a more engaging listening experience, which helps to focus attention and increase motivation. Surround sound systems are now available in the consumer marketplace. They are not currently in widespread use in schools, but can be used well, as this lesson demonstrates.

It is also possible to purchase special surround sound encoders that can be used on individual tracks of multi-track recordings at the stereo mix-down stage. These apply subtle 'psychoacoustic' changes to the audio signal so that sounds can be placed at different width, depth and height positions using only two loudspeakers. Their use was not encountered in this inspection survey.

Pupils in Year 9 at St Thomas More RC School were using software to create a twelve-bar blues sequence. The pupils relished the independence afforded by access to twelve computer workstations, and worked very hard.

Having this number of workstations makes it easier to ensure that all pupils can enjoy ICT access on a regular basis. This level of resourcing is still quite unusual in dedicated music classrooms. Some teachers have found that some older types of computer can be purchased for a fraction of the cost of current machines and they have been able to establish a number of workstations in the music classroom. Many have invested much personal effort in familiarising themselves with these systems and are reluctant to change them. Teachers will need to weigh the advantages of greater pupil access, personal familiarity and affordability against the disadvantages of increasing difficulty over repair, expansion, on-site technical support, compatibility with pupils' home systems and choice of software.

Many schools have separate rooms containing enough mainstream networked computers to accommodate a whole class. However, these are rarely all equipped with good quality soundcards or attached to MIDI instruments. In addition, their physical separation from the music classroom makes it difficult to integrate ICT directly with other forms of musical learning. These limitations can mean that teachers resort to giving pupils word-processing tasks that have very little to do with musical learning.

This Year 8 lesson at Deptford Green School was the last in a unit of work based on Pachelbel's Canon, and it consisted of self-appraisal and peer-appraisal of the pupils' arrangements, which had been recorded the previous week. When evaluating their work, the pupils made a clear distinction between their competence using the music technology and the musical effectiveness with which they had used it. They were very clear about when they were using music technology to support their rehearsal, and when it was an integral part of their piece.

Fifteen years ago computers were only just starting to appear in the classroom and, in those days, pupils, teachers and advisers were often impressed simply by the glamour of using technology as an event in itself. Increased familiarity has now helped us all to realise that music technology is simply a tool, which, like all others, is only useful if it helps to accomplish some grander objective. The pupils in this case study are already experienced enough in using music technology to be able to distinguish skill in using the tool from skill in accomplishing the musical objective. Teachers sometimes report feeling insecure because they are less experienced than some of their pupils in using certain kinds of technology. These teachers should take comfort from bearing in mind this fundamental principle.

Note

- 1 The music educators were OFSTED-trained inspectors, LEA advisers/inspectors and HMI based in different regions of England.

References

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List of schools visited

Archbishop Grimshaw RC School, Solihull
Aylesbury Grammar School, Buckinghamshire
Beckfoot Grammar School, Bradford
Berry Hill High School, Staffordshire
Bramhall High School, Stockport
Bridley Moor High School, Worcester
Chapel Park Middle School, Newcastle upon Tyne
Cooper School, Oxfordshire
Deptford Green School, Lewisham
Ernulf Community School, Cambridgeshire
Fearn County High School, Lancashire
Graveney School (GM) School, Wandsworth
Guiseley School, Leeds
Hirst Park Middle School, Northumberland
Huntington School, York
Ifield Community College, West Sussex
Kenton School, Newcastle upon Tyne
Kesgrave High School, Suffolk
King James's School, North Yorkshire
Litherland High School, Sefton
Maiden Erlegh School, Reading
Millais School, West Sussex
Mount Carmel RC Girls' School, Islington
Plumstead Manor School, Greenwich
Presdales School, Hertfordshire
Queen Elizabeth High School, Northumberland
Radley College, near Oxford
Robertsbridge Community College, East Sussex
Sir John Talbot's School, Shropshire
Spennymoor School, Durham
Spenny Valley High School, Kirkcaldy
St Benedict's RC High School, Cumbria
St John Bosco High School, Liverpool
St Osmund's CE Middle School, Dorset
St Peter's CE High School, Devon
St Saviour's & St Olave's School, Southwark
St Thomas More RC School, Haringey
The Beaconsfield School, Buckinghamshire

Janet Mills and Andy Murray

The Canterbury High (GM) School, Kent
The Cathedral School, Wakefield
The Ellowes Hall School (GM) School, Dudley
The Foundation Schools, Stamford, Lincolnshire
The Four Dwellings School, Birmingham
The Gryphon School, Dorset
The Meridian School, Hertfordshire
The Purcell School, Bushey
The Stonehenge School, Wiltshire
The Wyvern Community School, Hampshire
Therfield School, Surrey
Uppingham Community College, Leicestershire
William Parker School, Northamptonshire
Woolston High School, Cheshire