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The times they are a-changing: the sub-culture of music and ICT in the classroom

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Introduction

This paper reports findings from the Economic and Social Research Council (ESRC) funded research project InterActive Education, which focused on the ways in which new technologies can improve teaching and learning in educational settings.ⁱ The research design included five strands each of which considered Information and Communication Technology (ICT) in relation to a specific aspect: (i) teaching and learning, (ii) policy and management, (iii) subject cultures, (iv) professional development, and (v) learners' out-of-school uses of technology. Research from all strands combines to build a complex picture of ICT in education.

For this paper we draw upon data from the subject culture strand which emanates from the work of seven music teachers working in English primary and secondary schools, who collaborated with university researchers to research their classrooms. Each teacher considered a composition area of the music curriculum and then planned and, over two to three years, developed a Subject Design Initiative (SDI) – a unit of work – in collaboration with the researchers, as discussed by Triggs and John (2004). It was intended that the SDI would allow the teacher to explore the ways in which technology supports learning, in relation to composing music, within the classroom settingⁱⁱ.

Through our analyses of video data, teacher interviews and teacher dialogue within project meetings and during teacher/researcher discussion, we attempt to characterise the sub-culture of school music and ICT within both primary (age 4-11) and secondary (age 11-18) spheres. Our work is underpinned by Goodson and Mangan's definition (1995) of subject sub-cultures; using Shulman's "knowledge bases" (1987) as a lens to explore teachers' perceptions, personal philosophies and pedagogical styles, we investigate the sub-culture of music in the classroom using ICT. Other colleagues within the Interactive project have considered the effect of ICT on the subject cultures of science (Baggott La Velle *et al.*, 2004), providing a broad overview, highlighting similarities and comparisons in relation to the subject cultures of English, geography, history, mathematics, modern foreign languages, music and science (John & La Velle, 2004; John, 2005). As such, we will not attempt to identify how music differs from other subject subcultures but will provide a snapshot in time of the sub-culture of music and ICT in the classroom.

Computers in the music Classroom

Technology in the music classroom is not a new phenomenon. From the very early days of music class teaching, the history of technology in the classroom has been inextricably bound up with the adoption of technological tools used in wider society, particularly those used in professional and semi-professional music environments.

Examples include the gramophone Symes, (2004), electronic keyboards (Appell, 1993), audio recordings and surround sound encoder within multi-track recording (Mills & Murray, 2000) and MIDIⁱⁱⁱ sequencing (Airy & Parr, 2001).

Computers fuelled a musical revolution, not only in the classroom but also in the professional world (Taylor, 2001; Wright, 2002; Dillon, 2005). Software used in professional environments, impacted on music in schools and is now found in music classrooms alongside ‘cut-down’ versions that have the more complex features removed (Folkestad *et al.*, 1998; Mills & Murray, 2000; Kwami, 2001; Ofsted, 2004). Careful selection of appropriate software allows students access to this electronic medium for composition, whether or not they have ‘traditional’ - instrumental, notation and theoretical – musical skills.

In the late twentieth century, music technology led to the production of the new genres and styles of Hip-Hop, Garage and Drum ‘n’ Bass which completely rely on the technology for their realisation and fully exploit its possibilities (Bidder, 1999). Recent studies have shown that listening to music forms a large part of young peoples’ lives outside of school (Boal-Palheiros & Hargreaves, 2001; North, Hargreaves & O’Neill, 2000; Fitzgerald *et al.*, 1995), inevitably impacting upon their musical tastes and informing their musical preferences. Since much of the music that young people listen to involves or is created using ICT, technology can be viewed as providing the bridge between ‘school’ music and young people’s ‘lived’ music.

Theoretical Perspectives

1) The sub-culture of music

In his discussion of classification and framing of educational knowledge, Bernstein (1971) argued that induction into a subject is also induction into a subject culture or community that represents particular assumptions about knowledge and the nature of teaching and learning. Lacey (1977), Ball (1987) and Goodson & Marsh (1996) also described student teachers’ socialisation into teaching suggesting that in secondary schools, the existence of subject-based departments reify subject-matter distinctions.

The work of Goodson (1993 & 1997) and Goodson and Marsh (1996) is seminal to our understanding of subject sub-culture. Within the curriculum, Goodson views subject communities as conflicting groups of people with differing values, interests, identities and definitions of role and argues that, over time, these attitudes and views become characterised as ‘traditions’. Within this paper, our use of the term ‘subject subculture’ relies on the definition offered by Goodson and Mangan (1995) in their study of the effect of computer use within a variety of subject disciplines in secondary schools in Ontario:

... the general set of institutionalised practices and expectations which has grown up around a particular school subject and which shapes the definition of that subject as both a distinct area of study and as a social construct. (p. 615)

They argue that these subcultures adapt to new socio-historical contexts and through this evolution, practitioners’ pedagogical styles are redefined. Considering the impact

of computers on established cultures and subcultures in schools they suggest that computer use:

...sets off a range of *culture clashes* between antecedent subject cultures and cultures of computing.' (p. 627)

and that teachers must consider this on-going negotiation between teaching, learning and new technology carefully.

Aside from the work of John and La Velle (2004) and John (2005), subject-specific investigations into the subculture of music classroom teaching with ICT *within a naturalistic classroom setting* are sparse (DfES/BECTa, 2003).

We can gain some understandings of music teachers' thoughts on and attitudes to their subject from studies whose principal focus is other than that of music classroom subcultures and ICT (Knapp, 2000; Hennessy, 2000; Drummond, 2001). A sharper focus is provided by the recent research of Holden & Button (2006) who consider non-specialist teachers' attitudes towards music and the development of their musical pedagogy. 121 non-specialist teachers within 12 English schools were asked to what extent they felt able to teach music to children; however, their use of ICT did not feature in this study.

2) Teachers' knowledge bases

The work of Shulman has been at the centre of much discussion about the importance of teacher knowledge in relation to classroom practice. Shulman (1987) provided a taxonomy of "knowledge bases" in which he classified the types of comprehension required of teachers for promoting student learning:

- Content knowledge
- General pedagogical knowledge
the broad principles and strategies of classroom management and organisation which appear to transcend the subject matter
- Curriculum knowledge
the materials and programmes used by teachers as 'tools of the trade'
- Pedagogical-content knowledge
the special amalgam of content and pedagogy that is uniquely the province of teachers
- Knowledge of students
including their characteristics
- Knowledge of educational contexts
the workings of the group, classroom or school; regional and national situations; the character of communities
- Knowledge of educational ends
purposes and values; historical and philosophical roots of teaching and learning of the subject.

(adapted from Shulman, 1987)

Shulman suggests that knowledge of all areas is essential for teachers to teach effectively. What has subsequently proved to be most pertinent to educational debate

is the introduction of the concept of “pedagogical content knowledge” (PCK), the special amalgam of content and pedagogy that is uniquely the province of teachers. Rather than viewing teacher education from the perspective of content or pedagogy, Shulman suggested that PCK is essential in enabling teachers to organise and represent concepts, topics or issues in ways accessible to their learners.

Shulman’s work is still at the centre of much discussion about teacher education and effective preparation for work in schools in the 21st century. In recent years, research has incorporated reflection on Shulman’s “knowledge bases” with respect to technology in the classroom (Cloke & Sharif, 2001; Margerum-Leys & Marks, 2004; Woollard, 2005; Polyzou, 2005) and a number of researchers have re-conceptualised Shulman’s structure for science teachers (Veal and MaKinster, 1999; Cochran, DeRuiter and King, 1993; Baggott LaVelle, MacFarlane et al; 2004, as part of the same InterActive project upon which this paper focuses).

Research Framework and Methodology

Within the context of the InterActive Education Project, all subject teams (teachers and teacher educators/researchers) worked together over a period of three years, assembling as a full team to share ideas and, as teacher and researcher pairs, to develop, teach/research and review the Subject Design Initiatives (SDIs). In each school the Subject Design Initiative (SDI) was taught twice to allow for modification and further development of ideas and approaches: teachers carried out experimentation/pilot work in the first year, taught their SDI in its first form in the second year and revised and taught it again in the third year. Examples of changes that occurred were i) the development of extension work for high achieving students within the Secondary 1 SDI and ii) more detailed discussion about how to save work within the Primary 1 SDI.

Sample and Data Collection

Teachers’ attitudes to teaching and learning are influenced by many variables (John & La Velle, 2004); within music this includes beliefs about styles and genres of music, the nature of performance and composition, music and music education subculture traditions and personal pedagogical styles. To attempt to better understand these, a case-study methodology (Blaxter, Hughes and Tight, 2001) was employed for the collection and analysis of the data. This had two particular strengths: it provided a detailed, in-depth description of teachers’ attitudes whilst avoiding the problem of stereotypical answers often provided by large structured surveys.

As part of the InterActive project, semi-structured interviews were held with all teachers before and after the design initiatives were carried out. Notes were also made of discussions which took place before and after the learning and teaching activities themselves, and during more formal evaluations of work by the teacher, viewing the video data alongside the teacher- educator/researcher; in certain schools, teachers had access to the video data the day after their teaching and were, therefore, able to reflect upon the teaching and learning as the project progressed. At the regular project meetings for all music teachers and researchers, discussions were also recorded and transcribed. This approach allowed the research to benefit from a longitudinal dimension as well as from the opportunity for teachers to discuss issues

between themselves, and therefore provided a richer dataset than would have been possible from a single interview.

Each semi-structured interview lasted about one-and-a-half hours and the topics covered included historical and contextual influences upon teachers' pedagogical attitudes and practices; attitudes to the subject and its place in the curriculum; strengths and areas for personal development; opinions on the most effective models of teaching and learning; attitudes to change, and attitudes to ICT and music. Researchers from all subject teams developed these topics jointly.

Analysis

All data was recorded and transcribed, the texts providing the basis for analysis. The data was then categorised using six of Schulman's seven bases of knowledge (Schulman, 1987), all except Pedagogical Content Knowledge (PCK). In concordance with Schulman's delineation of PCK as an amalgam of other knowledge bases, we utilise this knowledge base to frame our subsequent discussion of music sub-culture, drawing upon data from the other six bases.

Coding sheets were constructed to allow for centralisation of the data in these distinct categories, allowing for direct and clear comparisons to be made between teachers' beliefs and attitudes. To enhance the reliability of the coding, approximately 25% of the transcripts were coded independently by two researchers, and the results shared.

Analysis of data

We start with Knowledge of Educational Ends owing to our conceptualization of this knowledge base as being all-embracing.

Knowledge of educational ends

All teachers explained that they valued the role that ICT could play in the music curriculum, whether they themselves were competent users or not. When selecting a focus for each teacher's Subject Design Initiative, their belief in the importance of practical involvement with music was evidenced through their wish to explore composition work in preference to other less 'hands-on' music activities:

I'm trying to provide an opportunity where children can face new challenges ... new tasks, new feelings ... their use of their imagination ... I'm trying to give them a different experience. I'm trying to make them think differently ... in the sense of what they think creatively, what they can do creatively.
(Secondary)

Teachers commented upon the need to provide students with a balance of activities, some of which involve the use of acoustic instruments and others the use of technology:

But I think you're always going to have people who enjoy playing guitars and ... playing in orchestras. ... and I don't think the two are incompatible. I think you can have both sitting very comfortably alongside each other. Because they both have worth in themselves. (Primary)

Without reservation, all teachers remarked upon the accessibility to music composition and performance that ICT offers, echoing Durant's (1990) notion of the 'democratisation' of music that MIDI technologies provide:

... for me to see children who will never learn an instrument ... For them to be able to sit down at a computer that they can do inside school and outside school and create something that perhaps they never ever would was a huge boost ... there would have been some of them who wouldn't have been able to join in ... with traditional instruments. (Primary)

The teachers noted that the technology appears to allow all pupils to participate fully in the composition process, whether or not they have instrumental and/or notational skills, concordant with the teachers' philosophy of 'music for all'. This was also a central theme when teachers expressed other positive comments about the affordances of the software^{iv}; these include the ability to 'see' the music:

... we did ternary form, I wondered whether that would stick really well because it was so visual... I think that was well taught, really, really well taught... you know they just knew it, they just understood it completely. (Primary)

...to play compositions into the computer at a slower tempo than it would eventually be performed:

Because it means they can program things in slowly and speed them up and move things about. I think it just does make it accessible to a lot more students. (Secondary)

..and to give students access to contemporary instrumental sounds and styles as well as links to music outside school:

And you know the guitarists were playing along 'cos there was ... Dance EJay 4 has got lots of guitars and 12 string blues, and all sorts of stuff. So they were accompanying stuff at home, which was really nice ... and then came in to share that. (Primary)

Content knowledge

The differences in "music and ICT content knowledge" are immediately apparent when considering the primary and secondary domains. All of the primary school teachers were at pains to point out that they were predominantly classroom teachers and not music teachers:

I'm a music coordinator ... I'm a primary school teacher, that's what I'd say I am. I wouldn't say I'm a music teacher...(Primary)

And, those whose teacher training was not specifically focussed upon music felt that they were not adequately prepared for teaching the subject generally:

But it was very, very small in terms of time spent on it. It was maybe two days? (Primary teacher discussing her training course).

These comments echo the concern for lack of subject-specific music training for primary colleagues raised in ‘The Disappearing Arts?’ (Rogers, 1998) and the lack of confidence of the primary teachers in approaching any type of music teaching, noted by Holden and Button (2006, p33).

These concerns were further exacerbated by the addition of ICT:

I find it a little bit of a chicken and egg – I’m not sure what I should be teaching, because I don’t know how to teach it, because of the packages that are available. And so if I don’t know what packages are available, how will I know what to teach them? (Primary)

In comparison, the secondary teachers were all confident in their Content Knowledge; none mentioned any specific areas of concern. The focus of their discussion was upon the technical knowledge required to fully understand the potential of the software for teaching and learning and to be able to cope with the technical issues arising from its use. Whilst most of the secondary teachers felt that they were competent ICT users, all raised the issue of needing to be an effective ‘technician’ or ‘trouble-shooter’ of ICT-related problems:

If things go wrong or if leads come out and you can’t remember where they go back in, it can ruin a lesson. (Secondary)

...a major concern for primary school teachers too:

Because frequently when we do ICT the technical problems become so enormous that you can’t get past that to do the thing you’re wanting to do. (Primary)

Indeed, many music software packages can appear quite complex. Using ICT in music not only involves the use of a school computer system but also ancillary equipment, possibly including MIDI music keyboards and interfaces and headphones. Mills and Murray (2000), reporting on Ofsted^v observations of British schools note that:

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. (p.145)

However, the teachers asserted the need to be able to routinely solve many diverse problems such as incorrect or faulty wiring/connections and incorrect settings to maintain the smooth running of lessons, but felt that a technician’s expertise was also necessary.

From the outset of the project, the music teachers all decided to focus their work upon using computer software to support student composition – a common usage in most secondary schools. John (2005) explains how the content of a lesson or series of lessons had to ‘have resonance’ with the technology. By contrast, in music, the ICT seems to more fundamentally underpin the composition activities observed, as it

provides an all-embracing environment for student engagement; therefore a clear understanding of its functions appeared to be essential to successful learning outcomes. This critically seems to influence the subject culture of music and ICT.

General pedagogical knowledge

Reflecting on the music teaching generally in their school, primary teachers explained the tension many non-specialist colleagues experience when conceptualising their own pedagogy for the teaching of music:

... some teachers in my school can get confused about how they have to start a music lesson, how they have to develop it, what they have to have at the end of a music lesson ... it's important that I get across to them, if they're covering certain elements that they've got in their planning, then that's just as important as having an end product. (Primary)

Primary and a number of secondary teachers felt that they needed support in developing their own pedagogies when using ICT; one secondary colleague required help in constructing her Subject Design Initiative (SDI) owing to a lack of experience concerning when to introduce specific computer skills to support the music learning. Nationally, Ofsted (2004) notes that where training is included in initial teacher training courses, in most cases it has provided "a good foundation", but even where undergraduate courses have included music technology, it does not necessarily follow that teachers:

...will have the necessary pedagogical skills for the effective use of such technology in the classroom. (p.10)

This was evidenced in the case of one primary school teacher, whose four-year training course included a significant amount of music computer work but who, nevertheless, required support developing the Subject Design Initiative (SDI).

A further challenge to existing music teaching pedagogies centres on the reliability and complexity of the equipment. All primary and one of the secondary teachers reported that if the technology did not function correctly the first time, it was expedient to abandon its use immediately:

Initially we were going to use ... an overhead projector attached to the laptop. And this didn't work in the very first lesson, so we just ditched it straight away and said well you know we can do this another way. (Primary)

In the continuing conversation, the teacher explains that the 'other way' involved grouping the whole class around one computer screen to view work. This meant that some students did not have adequate vision but this was a trade-off the teacher was prepared to accept.

One teacher did not realise that the students' use of headphones would affect her pedagogy:

And then of course you're missing opportunities to interact with them at the point at which they're composing (Primary)

Another teacher explained that they would have to build in more time for listening to/reviewing work as a whole class:

I think ...trying to hear the children's pieces of music more at the end? Because you know if you're rushing and you're not actually spending time reflecting on what they've done, and they're not able to give time to listening to each other's work.... (Primary)

A secondary teacher came to appreciate that the allocation of roles needed to be carefully planned to ensure equity:

And if one person's doing all the technical side they're not actually doing the practical work the same as everybody else. So I would like to see more of a balance of them doing both. (Secondary)

Another teacher commented on the implication for assessment of student work using ICT:

So if I was incorporating it into more of my schemes of work I think I would have to change the way I assess students. (Secondary)

Knowledge of educational contexts

When discussing the educational context of their work, teachers were concerned to stress that a major issue for classroom music with and without ICT was time:

The way things are going at the moment, I don't think there's a huge amount of value put on aesthetic or creative subjects in comparison to everything else...because there's so many new things coming in for teachers... music is being pushed further and further back... (Primary)

Within England, the recommended time for secondary music in the curriculum is one hour a week (DfES, 2002). Although an example given of an effective strategy applied to music is the provision of a one hour, structured lesson within the primary school (Ofsted, 2004) the teachers' perception was that other school initiatives, particularly those related to literacy and numeracy, eroded the time for music:

... you can't do too much because you have pressures of focussing specifically on certain aspects, as the literacy hours, and the numeracy hours have shown ... for an hour each a day, that takes a hell of a lot of time out of your day. (Primary)

Secondary teachers had a similar worry about time for musical development, but their focus of concern was in relation to national directives, with the increased emphasis upon administrative tasks, particularly target setting and assessment:

...as a subject we only see students for example once a week. We are now setting targets for each student and take up a whole lesson to do that.
(Secondary)

Secondary teachers were keen to point out the many changes, aside from those related to the National Curriculum, that had come into being in recent years, largely linked to examination specification changes. With regard to ICT, secondary teachers were pleased to report that a greater range and number of students were able to study music post-14, owing to the more widespread adoption of ICT in the GCSE specifications and the creation of the Music Technology A-level:

I see it from the interest of how it draws in other people that I think the (traditional) music course can possibly alienate itself to. (Secondary)

All teachers were unanimous in their feelings that the National Curriculum was, in essence, useful but primary colleagues reported that non-specialist teachers found it very hard to access, owing to their lack of music content and pedagogical knowledge:

I don't think it allows non-specialist music teachers to get a grasp of music. Because it's pitched at the wrong level ... most teachers being non-specialists, especially in music, will find it very difficult getting into it. (Primary)

They posited a real need for further professional development:

... I've done two INSET^{vi} days in my two years here and that shows how much time, or how little time music is allowed to be given by the other pressures of primary school education. (Primary)

A further concern, echoed by all primary colleagues, relates to the complexities that occur when music computer work takes place in a music classroom where only a single or a few computers are available and therefore music ICT work is carried out by individuals or small groups whilst others are involved in other subject work:

I mean I find it really difficult in a classroom to try and get really you know sort of learning on a computer when it's just a couple of children on the computer at one time in the corner, compared to a whole class focussed on one particular thing. (Primary)

Primary and secondary teachers reported the lack of computer equipment as an impediment to their teaching; their ideal was for all students to have access to a computer during a music lesson:

I find it quite difficult at the moment because with ... I mean ideally I think the best situation where ICT would work fantastically was if you had a computer for every child - or pair of children. (Secondary)

The secondary teachers recognised the need to develop quite distinct approaches and materials when designing lessons for situations in which some students composed with the computer and others composed using traditional instruments:

...because you know, if I have one computer, or have fifteen, my scheme of work is going to be greatly different. (Secondary)

Perhaps the strongest issue expressed concerning ICT provision was in relation to the constant need for technical support, which was considered lacking. Whilst there was general ICT support in all schools, teachers commented that technicians were either unaware of the needs of music, lacked the necessary technical skills related to music-specific software and hardware or were unable to be present at the point at which the support was needed for the students to continue to work effectively.

It's extremely frustrating. I mean I remember... you know feeling like I hadn't been able to get to the children who were doing the things that I was meant to be doing with them, simply because I was sorting out, you know, headphones, plugs, access to software. (Primary)

Notably, neither primary nor secondary teachers commented specifically on the impact of the National Curriculum upon their music teaching with ICT.

Curriculum knowledge

When analysing our data it was interesting to find that the teachers made very little explicit reference to the materials and teaching programmes that they used within their teaching. However, following detailed video analysis and reference to field notes it was noted that a range of materials and 'tools' were routinely employed and their use remained largely implicit.

Our observations revealed the significance of the use of paper worksheets and computer sequencer templates within their teaching with ICT. Whilst staff explained that worksheets were sometimes used in non-ICT lessons, their use took on a new level of importance when working with computers. The teachers felt that these were essential for providing a reference point for technical information, in particular, highlighting how to save work, which was a major problem for a number of classes. Some secondary teachers recognised the benefits of developing sequencer templates to scaffold students' work:

I've done a blues template already...and it is making me think about how I could use it throughout. Even as early as Year 7 really. (Secondary)

With two other secondary school classes, templates were used, yet the teachers made no reference to these as they were seemingly so much a part of day-to-day practice.

Knowledge of students

Teachers reported having a good understanding of the instrumental competencies of the pupils in their classes i.e. the instrument played, the standard achieved (grade) and their involvement in extra-curricular performing activities; in the classrooms where students used acoustic and electric instruments as well as computers for the composition work, this knowledge was apparent. However, whilst recognising the benefits within 'traditional' composition settings, some questioned whether having instrumental skills would necessarily improve students' composition with ICT:

...just because you play a traditional instrument or you play any instrument, you class yourself as, in inverted commas, 'a musician'. It does not necessarily mean that you can compose. (Primary)

A primary teacher explained the importance of pupils having access to appropriate instruments, including ICT, which met their expectations:

If the children are hearing something [on the computer] that they want to listen to again and again as opposed to percussion instruments that they feel they've used since reception (age 4-5) and they're still using in Year 6 (age 10-11), you know maybe that's not very exciting by the time you're 11. (Primary)

Further comments focussed upon the importance of the sophisticated musical sounds and the musical styles available via the music software, which were strong motivators to all students.

Another important issue was raised related to gender. Colleagues commented:

But if they can express themselves well through computers... particularly boys who are very 'sciency' ... And we get girls who are – not many, I've got to say, and we were working at this – turned on by technology. (Secondary)

Recognising that some girls 'shy away from' computers, one secondary colleague specifically designed his Subject Design Initiative (SDI) to take account of this.

It was interesting that teachers were well aware of student attitudes to music in school but had very little specific information about students' out-of-school use of computers for music:

And most of it we never get to hear about. (Secondary)

Despite this, one teacher considered its actual use was widespread:

I think they're doing loads with it outside school. (Secondary)

Whilst the teachers recognized the need to consider students' instrumental and notational skills developed outside the classroom, when constructing differentiated units of work the teachers had not acquired the information necessary to plan effectively for differentiation with ICT. Sutherland et al (2004) confirmed this finding in relation to all the subject areas within the InterActive project.

Further Thoughts

In the following discussion we draw out specific points relating to PCK, which embrace content, pedagogy, the curriculum, pupils, contexts and the teachers' philosophies.

Through our analysis of the data it quickly became apparent that there were clear subject culture differences between primary and secondary teachers, which might have been conjectured to be the case owing to the differing roles of the teachers within each institution; the primary school teacher is responsible for all areas of the curriculum, of which music is rarely more than 5% of curriculum time in the UK, and often much less; within the secondary school, the teacher is a subject specialist, although in some situations, may teach a second subject.

Certain software packages were considered suitable for the two different educational phases: in the primary phase, a sample sequencing package was advocated, whereas at secondary level, a MIDI & Audio sequencer was considered appropriate. A key conflict surrounds the use of sample sequencing packages: as Cain (2004) asks “Does the term ‘composing’ include manipulating sound samples composed by other people?” The originality of composition work using this technology was questioned, despite the fact that many contemporary musical styles are based upon this type of manipulation of samples from others’ previously recorded work:

...I just don’t think it’s right for Year 9 at all. I’d even doubt at Year 7 really I think... I mean I think it’s great for primary schools to look at structure and arranging and everything. And I might do it as an arrangement or looking at structure within music with Year 7 possibly, but...(Secondary)

Within our previous discussion of “music pedagogical knowledge” we presented a number of ways in which the teachers perceived necessary changes to their classroom practice when using ICT for music:

...it is a completely different approach, and a completely different way of teaching. (Primary)

This would appear to conflict with Goodson and Mangan who:

... found *very few* examples of teachers fundamentally reworking their lesson plans and pedagogy. (1995, p.624)

That said, despite some of the primary teachers’ lack of “music and ICT content knowledge” in relation to music, their strong general pedagogic skills, coupled with their extensive knowledge of the pupils, enabled them, with the support of other members of the music team, to adapt relatively quickly to the new demands of using music ICT in the classroom.

For those (secondary) teachers using sequencing software, there were inevitable changes to approaches within the classroom as a result of their perceptions of the necessity for pupils to systematically develop their music ICT skills throughout the first three years of secondary school. For this purpose, within one of the schools, which had enough computers for all students to work in pairs, the music department had reviewed their whole curriculum and reorganized work to integrate ICT. Within the ‘ICT units’, the clear progression in the ICT skills development seemed to take priority, in many respects, over the musical outcomes. The teachers explained that this quite ‘technical’ approach was essential to provide the students with sufficient

ICT skills for them to make good use of the computers for creative purposes later on, particularly at examination level:

...you certainly need to build it into the schemes of work to make it more structured. (Secondary)

Indeed, within the other two secondary schools, the teachers noted that lack of awareness of technical skills did, in many cases, inhibit the students' creative/performance work, despite the availability of support documents, in the form of worksheets.

Recognising that the students would need to develop awareness of the computer environment and facilities, the primary teachers all built in time for experimentation, at the beginning of their Subject Design Initiatives (SDIs). The two secondary teachers, who had not initially considered progression in the development of technical skills, realised this after teaching their SDIs, and spoke of the need to modify their plans to build experimentation time into the first few lessons, so that the technical skills necessary to the whole project could be developed.

Variations in pedagogy were also observed where some teachers permitted the students great freedom to discuss work within their own pair, with other pairs and with the group as a whole, whereas others required students to remain focussed on their own workstation. In the former case, this manifested itself in the teacher allowing students to move freely around the classroom observing and discussing with others in the process of composing and/or encouraging them to view other's work virtually by accessing other files from their own workstation. Perhaps understandably, this informal sharing of work led to considerable cross-fertilisation of ideas, which was accepted by the students as a natural way of working.

The constant irritations of computer problems raised the question 'How much of a technician does the teacher need to be?' The key tension was the balance between support provided by a technician and the technical support skills needed by the classroom teacher. Staffing for technical support reported by teachers varied widely from a permanent technician available just for the performing arts faculty to none at all. This disparity had predictable effects upon the music teaching strategies that could be employed and subsequently upon teachers' attitudes to ICT use in the classroom; the phenomenon has been described by many observers, including Odam (2000, p124) and Crow (2001, p161). Teachers without regular access to a 'music' technician all expressed their strong desire to have this form of subject-specific support. A prevailing notion was that perhaps music's perceived low status as a subject might have influenced the procurement of technical support staff; notably, the one institution with full support was a school with performing arts specialist status.

In fact, the majority of difficulties within music lessons using ICT, raised by the teachers, were not concerned with classroom teaching and learning issues but with broader contextual issues surrounding the work. Lack of technical support - particularly technicians' lack of familiarity with *music* as well as generic software, hardware and other musical equipment - was mentioned most frequently. Access to and availability of computers for music was also high on the agenda of the music teachers' complaints, as was the concern for time and support to develop ICT skills

further. Inevitably, the teachers found that these problems impacted strongly on their attitudes to and work with ICT. With regard to computer resources Ofsted points out:

It is rare for a department to be equipped to a level that allows whole-class use of music technology equipment at Key Stage 3. (2004, p.4)

Therefore, one might surmise that the reflections of our group of teachers are in line with many others within the UK.

However, despite these perceived impediments to working with computers in the music classroom, all teachers were keen to develop their own skills and find further opportunities to support students' musical development through the use of music computer software. They were keen to explain the exciting possibilities to engage students in work within different genres, including the opportunities for composing in modern contemporary styles and within mixed media settings (adding music to film) and to use the ICT to support the notion of 'music for all', providing a medium for student composition in which students did not need to rely on traditional harmony and notation skills.

This article has aimed to provide a snapshot in time of the sub-culture of music and ICT in the classroom. With rapid advances in technology, ever-evolving musical fashions and educational reforms in Britain, teachers' attitudes, pedagogies and required skills are likely to change even over the next few years. As such, further research that maps this changing sub-culture as the 21st century advances would be revealing.

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ⁱ This project reports on the work of 59 teachers within 10 schools and 1 FE college. The subject teams were: geography, history, English, mathematics, modern foreign languages, music and science. For further details, see www.interactiveeducation.ac.uk

ⁱⁱ For details of individual SDIs see http://www.interactiveeducation.ac.uk/music_designs.htm

ⁱⁱⁱ MIDI is an acronym for Musical Instrument Digital Interface

^{iv} See also Gall & Breeze (2005)

^v An acronym for Office for Standards in Education, an organization for monitoring education standards in state schools

^{vi} INSET is an acronym for 'In-Service Training'

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