Baseline assessment of pupil composing competencies on entry to secondary school: a pilot study

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This study addresses the baseline assessment of pupil composing competencies at age 11+. It asks whether it might be possible for these to be evaluated by the use of a whole-class listening task. A rationale for this proposal is discussed. Results from a pilot study which administered an original audiated puzzle-task to a cohort of pupils, followed by a related composing assignment, are presented, analysed and discussed. This methodology is shown to reveal information about pupil composing competencies.

Introduction

Secondary school music teachers in the UK and elsewhere are faced with incoming pupils at age 11+ who are likely to have attended a number of different feeder schools, and consequently undergone a wide variety of musical experiences in the years prior to their arriving at secondary school. Knowing what pupils know about, have done, and can do, are areas of concern for all teachers. In order to ensure progression in pupils' composing activities, the music teacher needs to decide what sorts of composing activities will be appropriate when the pupils first arrive in secondary school. This starting point has to enable differentiation, to stretch the most able, and to allow those with little or no experience to participate fully.

Background

The notion of assessment of individual baseline competencies does not at present have a consensual basis in music education. Indeed, the very meaning of the term 'competence' is problematic. Fodor's (1983) notion of modularity of the mind describes a set of related yet discrete subsystems, where individual 'modules' cope with different aspects of cognition. Imberty (1996), drawing on the work of Fodor, pointed out that:

> According to this model, the human cognitive system is composed of physically separated subsystems (competences), each of which corresponds to a specific body of knowledge and of procedures. These subsystems are autonomous and may be modified without the entire system undergoing significant changes. (Imberty 1996: 193)

The cognitive basis of competences proposed by Fodor is in contrast to Piaget's (1952) developmental descriptions by age. If the Piagetian notion is correct then it would be important to ascertain at which level the child was operating in order to ensure that

educational material was presented to them in a way which suited their current stage of development. As Hargreaves (1996) points out:

> If children do indeed pass through a sequence of stages, each one serving as a preparation for the next, then there is little point in attempting to introduce them to skills and concepts that exist at a higher level than that with which their artistic maturity can cope... (Hargreaves, 1996: 153)

The classroom ontology of 30 or so autonomous individuals composing simultaneously, with differing levels of experience, skill, and background – in other words variegated modular competencies – presents a challenging teaching situation. Knowing what to do is therefore a key task for the first few weeks in secondary school.

In an endeavour to gain access to information regarding pupils' composing competencies in a straightforward fashion, one possible avenue for exploration is to use Feldman's (1994) notion of non-universal development. From this perspective it seems possible that competencies required for composing might not have their origins solely and uniquely in composing activity. In Sloboda's (1985) model of the composing process, the notion of a 'repertoire of compositional devices' is germane. This is echoed by Paterson and Odam (2000) who discuss the notion of the 'dynamic library'. This dynamic library, or repertoire, seems likely to have its origins in a number of domains external to the creative. Enculturation, listening, performance, and a host of other experiences will all have a part to play. For the purposes of this present study, this has a potentially useful spin-off: if composing, although in Fodorian terms a discrete modular activity, has some roots in other cognitive functionings, then those other functionings could be used to gain access to an individual's propensity for composing. In other words, baseline assessment of composing competencies does not need solely to be measured by a composing task. If this is the case, then multiple simultaneous evaluations of pupils' work could be undertaken in the classroom.

The most straightforward way to access multiple individuals for this would appear to be the use of whole-class music-listening tasks. Widespread experience in England and Wales with General Certificate of Secondary Education (GCSE) listening tasks means that this mode of delivery is commonplace in schools, and there exists a wealth of expertise in this area.

Although there are precedents for the use of listening response tasks in perception of music these do not necessarily correlate with composing skills. In addition much of the work researching musical perception has used musicians as subjects (Serafine *et al.*, 1989; Dibben, 1994; Krumhansl, 1996), or has investigated specific perceptual constructs (Bharucha, 1987; Bigand, 1993). As little has been published relating to novice work in this domain, the procedures and principles from these studies provided a useful informant; some of their techniques were utilised, but the fundamental principles of the investigation were novel.

It is important to point out that the investigation of baseline competencies proposed here is looking at the *process* of pupil composing:

> The understanding of music composition has long been approached from a product centred perspective. That is, the final musical artefact becomes the object of study

through the theoretical analysis of form and stylistic constraints. Much can be learned about the structure of a piece in this way, but it explains little about the thought processes of the composer, about the mental acts that led to the complete work. (Smith *et al.*, 1993: 56)

The notion of composing competencies proposed in this study is to assist the teacher with understanding processes undertaken by pupils when working on their composing in class.

The research question

With these points in mind this study set out to see whether whole-class baseline assessment of pupils' composing competencies might be a viable proposition. The sorts of assessments being discussed here are formative assessments – Assessment for Learning (AfL), where the teacher uses information about the pupils to decide what to do next in a programme of study, or scheme of work. To be meaningful for the classroom teacher, any assessment of baseline composing competence needs to be administrable in a busy classroom setting, should not be overwhelmingly bureaucratic, and must provide useable data.

Although group listening is a comparatively straightforward classroom activity, there are still problems in finding out what is happening within the heads of the individuals concerned, as the intrusive nature of an intervention can alter the very thing being investigated:

It is . . . extremely difficult to monitor the cognitive processes involved in listening without running the risk of interfering with these processes to some degree by requiring subjects to exhibit overt and recordable behaviours. (Deliège *et al.*, 1996)

. . . and in order to find out what the pupils are thinking some form of overt recordable action is needed. In order to be as unobtrusive as possible, Deliège *et al.* (1996) used a listening task with a written response required after the event. Pencil-and-paper responses are patently a suitable method for use in schools. The type of listening task used in this case was one which would 'require listeners to assemble segments into a coherent whole' (Ibid). In this type of investigation a way of presenting material to the subjects is to create a series of 'puzzle tasks', where the role of the subject is to create for themselves a coherent ordering of the materials presented.

Materials

The devising of puzzle tasks demands simultaneous coordination of coherence, logic, transferability, cultural relativism and accessibility. The design of the tasks was undertaken with reference to the work of Deliège *et al.* (1996), Bigand (1990, 1993), Narmour (1989, 1992) and Sloboda (1985). The notion of the more-or-less automatic abstraction of structure that underpins the cognition of an ongoing piece of music, and the ways in which this abstraction of structure sets up a context of expectations for the abstraction of subsequent structure, forms the basis for the tasks being designed as paired audiated groupings. To be as inclusive as possible written responses were designed to be minimal, and be of a 'tick

Table 1 *Design constraints for audiated puzzle tasks*

Design constraint	Rationale
The pieces of music used should be as naturalistic as possible in the space of a few seconds	Deliège *et al.* (1996) had noted concerns with studies which concentrate on restricted subsets of tonal music
Artificial separation of musical elements would be eschewed in favour of a more holistic approach	Rather than artificially limit the music in a way that the pupils may find disconcerting, the majority of the pieces were composed to sound complete
The maximum length of the pieces should not exceed 30 seconds	. . .in order to avoid any potential attention span deficit
That the tasks be of varying levels of complexity	. . .in order to achieve some differentiation in the response patterns of the pupils
Stylistic typologies of the pieces should not be drawn solely from the classical tradition	Young (1971) and Shepherd *et al.* (1977) refer to the status of musical types, and the ownership of styles by youth cultures. Some tasks were composed in popular idioms to aid contextual familiarity
That all the music be composed specifically for the tasks	. . .in order to prevent any effects of recognitional familiarity

the box' type. Consideration of these issues produced a series of design constraints for the listening tasks. These are shown in Table 1.

In addition to these design constraints, consideration of the nature of the musical material for the tasks took account of the work of Cross (1999), who instanced four ways in which the perception of complex musical sounds might be organised:

1. Hearing a melody as a line
2. Hearing a piece as a predictable structure in time
3. Hearing a piece as chords
4. Hearing a piece as whole

By mapping the four domains of the Cross taxonomy onto the UK National Curriculum defined elements of Pitch, Duration, Dynamics, Tempo, Timbre, Texture and Structure (QCA, 2001), a series of listening-task parameters were produced. These were that the tasks should involve detection of:

(a) *Melodic discongruity (including elements of tonality)*

Any tonal melody sets up periods of tension and release, and of beginning and ending in a key. A common way of marking stasis is to have a melodic phrase end on a note other

than the key note, often the dominant or the submediant. By requiring the respondent to detect this some degree of familiarity with tonal systems is established.

(b)   *Rhythmic discongruity*

Much pop and rock music is based on a four beats in a bar structure. By establishing a standard four-beat pattern, for example, and then subverting it with accented off-beats, ability to detect rhythmic discongruity can be discovered.

(c)   *Subversion of beat within perceptibly altered structures*

By setting up, and then diverging from an established beat pattern, the ability of the pupils to detect this change allows access to more subtle effects of rhythm.

(d)   *Increased vertical structurings*

The addition of an extra part, for example a melody, to a chordal pattern usually occurs after the chordal pattern has been established. The most well-known case of this in popular idioms is the case of a tune beginning after an introduction.

(e)   *Expected cadential formulas and breaking of type*

By subverting normal cadential expectations the harmonic grasp of the pupils can be investigated.

Ten puzzle tasks were devised. Each puzzle task consisted of a short original segment of music, complete in itself, but with a discernible mid-point of stasis. The pieces were then split at the moment of stasis into two separate halves, or 'cells'. Thus each puzzle consisted of a pair of cells. The pairs of cells were then presented in the right order, or the wrong order. A total of 20 puzzle tasks were presented, from 10 segments of music, the puzzle appearing twice, in both its 'right' and 'wrong' versions. The task for the listener was to decide whether they were hearing the pieces in the 'right' or the 'wrong' order. In order to do this the listeners were presented with an answer sheet which required the respondents to tick one of two boxes 'right' or 'wrong' for each puzzle task (see Fig. 1).
　　　Musical materials were composed using a digital synthesiser and sequencing package. The 20 tasks were pseudo-randomly ordered so as to avoid consecutive presentations of the same task materials. These were then recorded onto CD for presentation in the classroom.
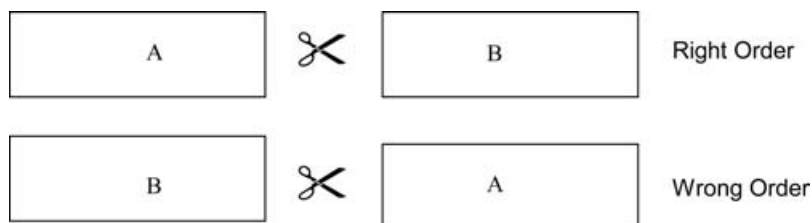

Fig. 1   The puzzle tasks

Initial trialling of the materials was undertaken, and the tasks were found to yield potentially valuable differentiatable results.[1]

Procedure

Puzzle-tasks would be administered to pupils as a listening task, requiring tick-box responses. After these responses had been marked and coded, the next stage would be to see whether information gleaned from analyses of codings could be evidenced in practice. In order to investigate this a practical composing task was undertaken by the same pupils, and results compared with coded scores. The composing task the pupils undertook was devised in consultation with the head of music in the pilot-study school. It required the pupils to devise a piece of music based on a series of elements derived from the listening task.

The composing task was introduced to the class by their normal class music teacher. Essential elements of the task were reproduced in the form of a written assignment sheet containing the instruction:

> You are to make up a piece of music which uses some or all of the following 'boxes'. You can include material in addition to this. The piece should be entirely original, and should not contain any music which you have heard before.

There were five 'boxes' drawn on the sheet containing:

  (i) a 5/8 rhythm of five equal quavers
 (ii) a chromatic ascent from C to F#
(iii) the chords of C and G7
 (iv) a dotted quaver – semiquaver rhythm in 4/4
  (v) the instruction 'a long held low note'.

Separation of harmonic and rhythmic elements had not been designed to be total, because, as was discussed in Table 1 above, discrete exclusion of one category from another could result in artificiality.

Participants

This pilot-study was undertaken in a school in the English Midlands. The school was a comprehensive 11–14 school, on the outskirts of an industrial town. Although designed as materials appropriate for year 7 pupils to undertake on transfer in September, it was decided to trial materials with a year 7 cohort slightly later on in the year. This was so that information gained from the coded puzzle tasks and subsequent composing activities would refer to pupils of whom the teacher had been able to form some judgements already, so allowing the teacher to comment if any notable discrepancies occurred (however, this proved not to be the case in practice).

Puzzle tasks were administered to two year 7 (aged 11 years) mixed-ability classes in the pilot-study school ($N = 55$: 28 female, 27 male). They were presented to the classes by their regular class music teacher, and done during the timetabled class music session. Response sheets were marked and coded by the researcher.

The normal way of working in the pilot-study school was for pupils to be given a common starting point, or stimulus, for composing, and then the pupils set to work in friendship groups at the task. In order to give some ecological validity to the investigation, this practice was adopted for the composing task. The case-study groups were allowed to work without direct teacher intervention, so that this could be as naturalistic as possible, and would hopefully reveal insights into the composing process. One composing group from each of the year 7 classes was randomly assigned for subsequent investigation of composing practices.

The first of the two composing groups consisted of four girls. Given a free choice of instruments from the school's collection, the members of this group chose to work using two melodic instruments, an electronic keyboard and a glockenspiel, and two unpitched instruments, a drum and a tambourine. The piece the group produced fulfilled the requirements of the task, was 16 bars long, and involved melodic material accompanied by tonic and dominant harmonies. The design of the piece was determined entirely by the group. The use of a regular 16 bar phrase implies that some form of structuring was being placed on the piece, influenced either by things they had learned before, or through phrase-length conditioning from enculturation.

Group two was made up of two boys and three girls. Two pupils worked using melodic instruments, a keyboard and a glockenspiel, and three pupils used unpitched instruments, a pair of bongo drums, a tambourine and a cabasa-afuche. The piece this group produced was built on phrase lengths of four bars. Within this a number of simultaneous ostinato passages occurred, sometimes independent of each other in everything except phrase length. The music of this group again fulfilled the requirements of the task. In harmonic terms some discordant moments occurred as notes of the ground bass chord sequence clashed with the simultaneous rendition of chromatic melodic fragments, this seems to be a result of strict adherence to the constructional possibilities offered by the fragment, as opposed to deliberate choice of a tension-release harmonic or cadential structure.

Analysis

For replication in classroom settings, coding of the puzzle tasks had been designed to be simple, involving pupils gaining a mark for correct identification. Figure 2 shows percentages of correct results obtained by the class for each category. This shows that the highest score achieved was that of detection of 'right' Cadence.

Analysis of results was undertaken on a number of levels. In addition to the initial five criteria described in points *a* to *e* in the – Materials section above, two meta-categories – Melodic/Harmonic and Rhythmic/Temporal – were created, grouping together the tasks in those particular domains.

Scored results of the listening task are shown in Table 2. Group one followed the general scoring of the whole cohort fairly closely. Group two diverged from this in a number of ways. Their average scores for detection of melodic discongruity was considerably lower than the average, whilst their score for detection of rhythmic discongruity was higher. In the meta-categories, scores for which are shown in Table 3, group two can be seen to be dipping substantially in their response in the melodic/harmonic domain.
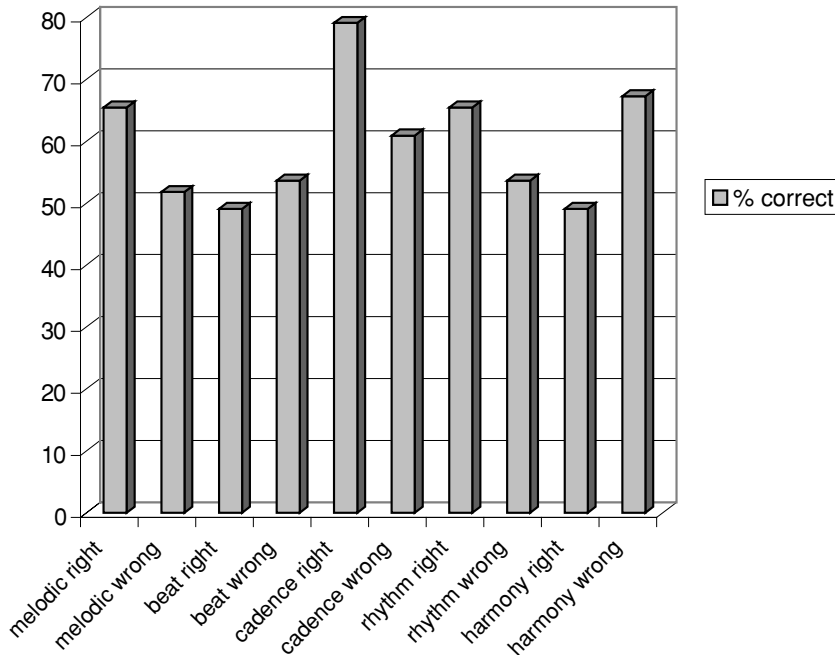
Fig. 2   Results of all pupils in target cohort. (In this chart 'right' and 'wrong' refer to the order of presentation of the musical task material.)

Table 2 *The composing groups compared with the average*

Detection of:	Group 1	Group 2	Cohort Average
Melodic discongruity	62%	25%	58.6%
Subversion of beat	58%	50%	51.4%
Expected cadential	71%	62%	70%
Rhythmic discongruity	54%	75%	59.5%
Increased vertical	50%	50%	58.1%

Table 3 *Meta-categories of the composing groups*

	Group 1	Group 2	Cohort average
Melodic/Harmonic average	61%	45%	62.2%
Rhythm/temporal average	56%	62%	55.4%

Discussion

The scores group one achieved in meta-categories of the puzzle tasks would suggest that they would place rhythmic/temporal elements as being roughly equal to melodic/harmonic

in their piece. This is in fact what happened. The placing of melody against background rhythm was 'correct' in the sense that the players stayed 'on the beat', and balanced two bar phrases centred around the alternation of tonic and dominant chords formed harmonic outcomes which could be deemed as 'expected' in the sense of the conventional.

The product outcomes of the composing process show that the low score which group two attained in the melodic/harmonic meta-category of the puzzle tasks was matched by an equivalent lack of awareness of the implications of the harmonic content of the music. The higher rhythmic awareness which their scores suggested was evidenced by their ability to 'hold' rhythms of a keyboard auto-bass whilst playing different versions of their melody, at differing times against it. The semi-improvisatory nature of a central section again shows that the rhythmic sense of the players held good, sometimes almost at the expense of cadential progression.

Gender issues

Although a specific investigation of gender differences had not been planned, nonetheless the disposition of the friendship composing groups meant that some gender issues arose. Across the cohort the average female performance was some 15% higher than male, as Table 4 shows.

Results in meta-categories, shown in Table 5, reveal that in the rhythm/temporal domain girls performed considerably better than boys, whereas the boys were very slightly better in the melodic/harmonic.

It has been noted that in gendered observations of instrument choice, boys tend to show a preference for rhythmic instruments, such as drums and cymbals, over melodic instruments, such as glockenspiels and xylophones (O'Neill & Boulton, 1996; Green, 1997; Harrison & O'Neill, 2000). In the case of this cohort, coded scores would tend to suggest that this preference is not supported by action. However, this study is only of a small

Table 4 *Mean score differences by gender*

Detection of:	Male	Female	Female difference
Melodic discongruity	62%	55%	−7%
Subversion of beat	47%	55%	8%
Expected cadential	70%	69%	−1%
Rhythmic	54%	64%	10%
Increased vertical	55%	60%	5%
Total			15%

Table 5 *Gendered differences in meta-categories*

	Male	Female
Melodic/harmonic average	62.6%	61.9%
Rhythm/temporal average	50.9%	59.8%

sample, and local conditions are likely to have an effect. Class teachers in other schools would need similar information in order to consider the implications of gender issues when devising units of work.

Conclusions

A group of pupils composing together involves individual competencies being 'pooled' for the purposes of the task. An obvious methodological limitation of this study, that of conflating individuated scores with group composing activities, was dictated by the ontological requirements of the pilot-study school. However, awareness of the coded scores, which had been made available to the teacher, meant that she was able to use this information to help with her understandings of what they had achieved. The teacher commented:

> Knowing where their strength lies means I would be able to steer them in the right direction, so knowing that some were better at, say, rhythmic things means I would want to get them to think about melody.

In practice, the teachers in this pilot-study found that the mixture of quantitative data from the puzzle tasks and qualitative data from the composing assignment gave them a sense of where the pupils needed some more work, and where their strengths and weaknesses were located. The feedback and assistance which the class teachers were able to give to the pupils was felt to be much more informed as a result of this, in that teachers were able to focus on specific areas. The teachers in question decided not to reveal scores of the pupils on the tasks, but they could use this information to feed into future lessons, and allow for differentiation, depending on the perceived needs of the pupils.

This study has shown that any notions of composing being a unitary domain-specific competence in Fodorian terms cannot be tenable. Differences in scoring of meta-categories reveal that cognitive modularisation is a more likely understanding of how individuals process prior-knowledge before embarking on composing tasks. This accords in part with the findings of Boltz (1999: 67), who noted that 'pitch and temporal information can be encoded either in an independent or unified fashion'.

It would seem here that independent encoding is occurring. This has implications for teachers, in that in order for pupils to make progress at composing, individual education plans will be needed so as to consider relative strengths of each pupil.

A key aspect of composing is the notion of fostering divergent thinking (Webster 1992, 2003). Puzzle-tasks alone are not able to account for this, and so their primary purpose is as a heuristic short-cut before subsequent developmental work takes place. This is important, as Mills (1996) warns teachers of the dangers of thinking that the best way to begin is to assume nothing, particularly in view of the fact that 'secondary music teachers questioned in meetings said that they have to 'start again' when pupils transfer' (QCA, 2004: 12).

Having some knowledge of what pupils can do means that potentially false assumptions of a zero knowledge base can be avoided; thus *appropriate* work can be developed which builds on prior knowledge, encourages divergent thinking, and fosters relevant skill and concept development.

Implications for further research

The utilisation of whole-group listening tasks as a straightforward means of investigating baseline competencies is an enticing one. Problems arise when trying to construe too much from results of this. Criticisms previously levelled against audiated tests of musical ability can apply here too. Cultural specificity and perceived status of typologies used can both have adverse influences on pupil outcomes. In order to overcome these, further study is needed to find out whether the information gained proves to be of use to the teacher in the classroom. Further work is also needed to investigate individuated outcomes of puzzle task–composing task linkages, what developmental work in composing might look like and how teachers can help pupils 'get better' at composing.

Afterword

This study set out to investigate whether baseline assessment of composing competencies could be investigated by audiated means. This pilot study has shown that knowledge gained from such a process can be useful to the class teacher, but that this is a fairly 'blunt instrument' for doing so. However, teachers in the pilot-study school reported finding results from the puzzle-tasks useful, and that as a part of their baseline assessment programme for incoming pupils, it was a potentially useful tool.

Note

1   A copy of the puzzle tasks will be included on the next BJME CD.

References

BHARUCHA, J. (1987) 'Music cognition and perceptual facilitation'. *Music Perception*, **5**, 1, 1–30.
BIGAND, E. (1990) 'Abstraction of two forms of underlying structure in a tonal melody'. *Psychology of Music*, **18**, 1, 45–59.
BIGAND, E. (1993) 'The influence of implicit harmony, rhythm and musical training'. *Contemporary Music Review*, **9**, 123–138.
BOLTZ, M. G. (1999) The processing of melodic and temporal information: Independent or unified dimensions? *Journal of New Music Research*, **28**, 1, 67–79.
CROSS, I. (1999) 'AI and *music perception*'. *The Society for the Study of Artificial Intelligence and the Simulation of Behaviour – Quarterly Journal, 102*, 12–25.
DELIÈGE, I., MELEN, M., STAMMERS, D. & CROSS, I. (1996) 'Musical schemata in real time listening'. *Music Perception*, **14**, 2, 117–160.
DIBBEN, N. (1994) 'The cognitive reality of hierarchic structure in tonal and atonal music'. *Music Perception*, **12**, 1, 1–26.
FELDMAN, D. H. (1994) *Beyond Universals in Cognitive Development* (2nd edition). Norwood, NJ: Ablex Publishing.
FODOR, J. (1983) *The Modularity of Mind*. Harvard, MA: MIT Press.
GREEN, L. (1997) *Music, Gender, Education.* Cambridge: Cambridge University Press.
HARGREAVES, D. (1996) 'The development of artistic and musical competence'. In I. Deliège & J. Sloboda (Eds.), *Musical Beginnings.* Oxford: Oxford University Press.

HARRISON, A. C. & O'NEILL, S. A. (2000) 'Children's gender-typed preferences for musical instruments: an intervention study'. *Psychology of Music*, **28**, 1, 81–97.

IMBERTY, M. (1996) 'Linguistic and musical development in preschool and school age children'. In I. Deliège & J. Sloboda (Eds.), *Musical Beginnings.* Oxford: Oxford University Press.

KRUMHANSL, C. (1996) 'A perceptual analysis of Mozart's Piano Sonata K 282'. *Music Perception*, **13**, 401–432.

MILLS, J. (1996) 'Starting at secondary school'. *British Journal of Music Education*, **11**, 1, 191–196.

NARMOUR, E. (1989) *The Analysis and Cognition of Basic Melodic Structures.* Chicago IL: Chicago University Press.

NARMOUR, E. (1992) *The Analysis and Cognition of Melodic Complexity.* Chicago IL: Chicago University Press.

O'NEILL, S. A. & BOULTON, M. (1996) 'Boys' and girls' preferences for musical instruments: A function of gender'. *Psychology of Music*, **24**, 2, 171–183.

PATERSON, A. & ODAM, G. (2000) *The Creative Dream.* High Wycombe, UK: National Association of Music Educators.

PIAGET, J. (1952) *The Origin of Intelligence in the Child* (M. Cook, Trans.). London: Routledge and Kegan Paul.

QUALIFICATIONS AND CURRICULUM AUTHORITY (QCA) (2001) *National Curriculum: Music.* Retrieved December (2001), from http://www.ncaction.org.uk/subjects/music/progress.htm

QCA. (2004) *Music – 2002/3 Annual Report on Curriculum and Assessment.* London: QCA.

SERAFINE, M. L., GLASSMAN, N. & OVERBEEKE, C. (1989) 'The cognitive reality of hierarchic structure in music'. *Music Perception*, **6**, 4, 397–430.

SHEPHERD, J., VIRDEN, P., VULLIAMY, G. & WISHART, T. (1977) *Whose Music? A Sociology of Musical Languages.* London: Transaction Books.

SLOBODA, J. (1985) *The Musical Mind.* Oxford: Oxford University Press.

SMITH, M. , SMAILL, A. & WIGGINS, G. A. (Eds) (1993) *Music Education: an Artificial Intelligence Approach.* London: Springer-Verlag.

WEBSTER, P. (1992) 'Research on creative thinking in music'. In R. Colwell (Ed.), *Handbook of Research on Music Teaching and Learning.* New York: Schirmer.

WEBSTER, P. (2003) 'Asking music students to reflect on their creative work: encouraging the revision process'. *Music Education Research*, **5**, 3, 243–248.

YOUNG, M. (Ed.) (1971) *Knowledge and Control*. London: Collier-Macmillan.