How can the understanding of analysis of sonata form movements be deepened by the use of graphic representation?

Ferrari, D., Kokotsaki, D., Newton, D.P. & Newton, L.D.

School of Education, Durham University, Durham, UK

Abstract

The aim of the study is to explore the nature of understanding when learning music through the use of 'graphic representations' trialled in a learning conversation with a ten-year old flautist. It is argued that the powerful visual component of presenting a musical score in graphic form can enhance students' understanding and ability to process the score more effectively by providing a succinct way of accessing the data. Central to understanding the analysis of sonata form movements is the need to create a representation which is independent from the existing score. This study offers a practical way of doing this which has the potential for wider application.

Keywords

Teaching techniques, secondary music methods, musical understanding, music analysis, graphic representation, music education, music learning

Short biographies of authors

Dimitra, MA, PhD is a lecturer at the School of Education and a member of the Education Evaluation Group at the Centre for Evaluation and Monitoring at Durham University. She teaches undergraduate and postgraduate modules on the Arts in Education. She has been principal investigator or co-investigator in a number of research projects including leading the evaluation of the Restorative Approaches initiative in County Durham and a recent piece of research funded by the Nuffield Foundation about improving the primary-secondary transition in music education at the North East of England. She is one of the authors of the Sutton Trust-EEF Teaching and Learning Toolkit and is currently the lead process evaluation researcher for the Calderdale writing intervention funded by the Education Endowment Foundation.

Professor Douglas P. Newton PhD DSc teaches and researches in the School of Education of Durham University, UK. His current interest is in the purposeful kinds of thought in formal education, such as, understanding, creative, evaluative and wise thinking. Going beyond the cognitive strategies for exercising such thought, he has described how moods and emotions interact with cognition in ways which direct and shape these kinds of thought. His very successful book, *Teaching for Understanding*, is now in its second edition (Routledge, 2012), and his latest, highly praised book, *Thinking with Feeling* (Routledge, 2014) has been very well-received.

Lynn Newton, MA, PhD, is Professor of Education at Durham University, where she is Divisional Director for the School of Education's range of Initial Teacher Education programmes. She teaches on a range of postgraduate programmes, leading a module on *Purposeful, Productive Thought* and supervises doctoral students. Previously she worked in schools before moving into university and has published widely in the areas of education generally and science education in particular. Her main interests are effective communication and strategies to encourage engagement. Her latest books are *Creativity for a New Curriculum: 5-11* (Routledge, 2012) and *From Teaching for Creatvie Thinking to Teaching for Productive Thought: An Approach for Elementary School Teachers* (ICIE, Paris, 2013).

How can the understanding of analysis of sonata form movements be deepened by the use of graphic representation?

Understanding in the context of music and why it is important

Students can find it difficult to construct an understanding of music presented in conventional ways. In the belief that it is through analysis that students come closest to understanding in music, the study explored the extent to which graphic representations created by software might support that understanding. The particular context presented is that of a ten-year-old flautist, Jenny (pseudonym), coming to understand sonata form movements.

Recently Jenny took her Grade 5 Flute examination and gained full marks for her scales. One of the scales she had to play was A flat major, and all the evidence before the examination suggested that Jenny was confident in her understanding of it. However, when faced with the relatively straightforward flute part of Sibelius' *Finlandia*, she found sight reading the familiar, slow, A flat major passage surprisingly difficult. Not only did she omit the additional flat (D flat), she played some of the written A flats (the key note) as A naturals. Playing scales to pass an examination requires regular practice to the extent that the process becomes one of recalling 'muscle memory', which greatly reduces the performer's chance of making a mistake (Aellio & Williamon, 2002). But does this mean the performer *understands* A flat major?

Two of the more familiar frameworks for thinking about learning, Bloom's taxonomy of educational objectives and Biggs and Collis' SOLO taxonomy, are instructional designs; that is, they are preoccupied with the learner's ability to construct meaning (Moseley et al, 2005,

p. 45). The ability to play a scale would be classed in Bloom's taxonomy as a lower order thinking skill, and by the SOLO taxonomy as a lower order outcome, for it requires little more than sufficient technical control to play a memorised pattern of notes. In Nickerson's study of how misconceptions affect understanding he identified problems at the initial level of learning pertaining to concepts, relationships and processes which can have long lasting ramifications for the learner (Nickerson, 1985). Even the most familiar mathematical symbol, the equals sign, is not fully understood by some students, yet it is used by every student from the beginning of their maths studies. If we substitute his example of "a whale is a mammal" (p. 217) with 'A flat major is a scale' we can begin to see the nature of the problem as this illustrates Nickerson's point that words mean different things in different contexts. Is A flat major a scale for measurement, a weighing scale or a scale on a fish? To complicate matters, A flat major is also a *chord* and a *key*.

As Newton points out, understanding entails making such information meaningful (Newton, 2012), and, as understanding cannot be transmitted, it can only be achieved by students making connections between pieces of information for themselves. In addition, Bruner was of the view that by applying the facts through activity (either mental or otherwise), these connections are made so that learners construct their own meaning (see McGregor, 2007). By playing *Finlandia*, Jenny is engaging in precisely this sort of activity, but does she yet understand what it means when we say the piece is 'in' the key of A flat major, and does she need to? Newton (2012, pp. 5-8) offers five reasons why understanding is important:

1. It can satisfy personal needs – we seem to want to know 'Why?'
2. It can facilitate further learning.
3. It helps us respond flexibly in new situations.
4. It renders large amounts of information (data smog) meaningful.

5. It is the essence of creativity, bringing together ideas to make one meaningful whole.

How is this relevant to understanding in the context of music? Fluency in performing a scale can lead to the facility of further learning (2 above). Performing a scale from memory is not as useful as the ability to read music fluently, however in new situations it can be very useful. In recognising a passage as being made up of a scale with which the performer is familiar, the passage can be sight read with more ease (3). A common conundrum faced by musicians is a series of accidentals in a rising pattern, which, on reflection, is merely a chromatic scale hidden by 'data smog', and which can be performed by recalling memorised patterns (4). By performing *Finlandia* in an orchestra, Jenny is party to the collective creative act of ensemble performance (5), albeit at this stage of her musical career with a minimal input (Frith, 2012). And students often do want to know 'Why?' things are as they see them (1).

Hodges and Sebald (2011) illustrate the process of musical understanding with the metaphor of a witty joke. A joke has several levels of understanding. The listener must know the meaning of the words and be able to join the words together meaningfully into clauses. These have to be understood collectively by making connections between them and with prior knowledge. The final understanding entails a surprising and often delightful connection to something unexpected, the so-called punch line. Cognition at each level leads to understandings and the emotional reaction of laughter. (In Billy Wilder's film *Some Like it Hot* (1959), when Joe asks Sugar Kane where her father used to be a conductor, the viewer can only understand the response of "on the Baltimore and Ohio" as a joke if they know that she is referring to the railroad company and not a concert hall.) A similar process takes place when listening to music. Individual notes are connected to form phrases, information regarding rhythm, structure and melody is remembered so that an overall picture of the

piece can be formed and it proceeds as one expects, or takes a surprising turn. Research on how this process of meaning making can be supported is, however, limited (Todd & Mishra, 2013).

Examination boards in England refer to three distinct domains: performance, composition, and appraising, which we shall refer to as 'analysis'. We have seen that proficiency in performance is not necessarily an indicator of understanding in the context of music. Nevertheless, performance tends to attract the greater proportion of marks in examinations, only one examination body giving more for analysis. This suggests that performance is a greater concern, and, at best, a proxy indicator of understanding. This perception, however, is challenged. Cook, for instance, describes analysing Beethoven as having to live 'with it for a day or two' (Cook, 1994, p. 1) and it is through analysis that the learner can construct meaning. But what does analysis mean? Swanwick points out that people have a universal need to give everything a form (1991, p. 31). In music, Aeillo and Williamon (2002, p. 178) illustrate the 'macrostructure' through the overall form (symphony, concerto) and the 'microstructure' through the individual movements, their sections, keys and themes. It is through analysis that we can begin to understand the form or structure of a musical piece. Forte and Gilbert (1982, p. 276) describe sonata form as "the most important large-scale design in tonal music" and so it is not surprising that the analysis of a given movement in sonata form can be expected to appear in examinations.

The impact of musical background and experience on students' understanding

Students following a typical programme for 14-16 year olds in the UK (for example, The General Certificate in Secondary Education) may have to analyse the first movement of Mozart's *Symphony No. 40* as an example of sonata form. The problem is one of

understanding of context. For these students, often well-versed in popular culture music, trying to understand Mozart may be like a Westerner trying to understand a piece of Tibetan throat music: understanding happens at a superficial level because the context has to be familiar for deep understanding to take place (Hodges & Sebald, 2011). Such students are often unfamiliar with staff notation and the associated terminology.

When studying orchestral sonata form movements, students use a full orchestral score, often printed at a reduced size. The score attempts to address a complex issue, for as the German philosopher Herder claimed 'visibility can never be audible, just as audibility can never be visible' (see Lissa, 1968, p. 530). As Hegel (in Lissa, 1968) discussed, music is the only art form which is temporal in nature. The listener must simultaneously attend to what they are hearing while considering what has been, and in the case of sonata form, what is yet to come (Lissa, 1968; Storr, 1992). It is no coincidence that the work of Herder and Hegel is contemporary with the great sonata form works of composers such as Haydn and Beethoven.

While notation has 'taken on its shoulders the task of remembering' (Lissa, 1968, p. 534), this does little to help a student who lacks the skills necessary to interpret a score. Commercially available scores support the teaching of music in school examinations. Teachers feel compelled to purchase and use these resources, but often do little more than present their students with data smog. Unfamiliarity with layout, clefs, transposing instruments and the simultaneous use of different languages baffle many students. For example, a typical score for Beethoven's Symphony No. 5 uses four clefs (treble, alto, tenor and bass), two transposing instruments (Clarinets in B flat and Horns in E flat), and four languages (English, French, German and Italian). There are different names for the notes in French and German (B flat is Si flat in French and B in German). In addition, the notes on the

violin part are played by anything up to 12 players while the notes on the clarinet part are played by one player only, except in this case where the marking ‘a 2’ indicates that both clarinetists play that part. To the layman this can be confusing. Davidson and Scripp describe the score as a ‘procedural map’ (see Newton, 2012, p. 18), but what use is a map if you cannot interpret it? And what are they trying to understand?

For many students, melody is the most obvious musical feature (Hodges and Sebald, 2011), yet analysis is concerned primarily with structure. The principal indicator of structure in sonata form is key, with melody and instrumental texture coming second. Some sonata form movements use the same melodic material for both the first and second subjects. Haydn’s *Symphony No. 104* is such a piece. Students have to consider the structure in terms of key rather than melody. To a rock musician, structure of a popular song can be analysed simply by noticing the pattern of the lyrics, but text is not a feature of sonata form movements. Even to an experienced teacher the limited variety of instrumental textures can be problematic when analysing a movement, such as the opening of Mozart’s *Clarinet Concerto*, as this makes it harder to differentiate with ease, whereas the performance or recording is in the sonata form structure. A consideration of contextual issues, such as students’ background and skills can show the complexities that the understanding of analysis will have for different students. For example, guitarists find it hard to visualise the horizontal nature of scalic and chordal relationships as they visualise chords as hand shapes. Untrained singers form concepts of intervallic relationships in the context of the piece they are currently hearing or performing, as if there were one universal construct for relating pitches to each other. In these circumstances how can students understand their analysis?

Learners taking examination courses arrive with their own conceptions, knowledge and expectations and that layers of understanding are built over time (Newton, 2012). In almost

every learning situation some form of scaffolding needs to support the learner as they build their own concept of what something means, and it is to this that we now turn.

Graphic organization

Central to understanding the analysis of sonata form movements is the need to create a representation which is independent of the existing score. Making thinking visible is useful and visual representation can supersede verbal representation (McEdens & Porter, 2001; McGregor, 2007). Aeillo and Williamon (2002) explain that musical visual memory is often associated with images of the score, yet, as previously mentioned, data smog can obscure it. At the same time, the mind is like a library with huge storage space but only a small sorting table, and so a representational tool that fits the table is needed (Newton, 2012). The analytical approach of Heinrich Schenker provides one which helps to clear the data smog.

Schenkerian analysis of harmony goes beyond description of individual chords and cadences to consider harmony as the governor of extended passages of music (Forte & Gilbert, 1982). It also allows us to attach significance to harmonic progressions rather than just describe them (Cook, 1994). Schenker's primary concern is with the movement of harmony away from and return to the tonic chord through the final cadence. As such, his analysis of Bach's *Prelude in C, BWV846* condenses the work into three chords; C major – G major – C major. Schenker's analysis of the first movement of Mozart's *Symphony No. 40* (see Forte & Gilbert, 1982) is similarly parsimonious. His 'analytic graph of harmony' represents just under five minutes of music and has reduced hundreds of notes to a mere twenty-six. While the barrier of staff notation is still present there has been a significant reduction in data smog. But can we get rid of the staff notation altogether? Eisner argues that the development of software has allowed us to display 'in graphic form what cannot be displayed in text or number' (1993, p. 6). Folkestad (2012) uses Vygotsky's notion of *tools* and *artefacts* to explain how

ICT can be used to achieve a 'musical end'. Here, ICT will be used as a tool to assist the analysis of a score (the artefact).

Music has its own written language, but is arcane for many students. In response to the need for 'a complete rethinking', Harris (2011, p. 20) proposes using the score as an interactive document. But this document is, on the one hand, replete in technical information and, on the other, short on its meaning. The notion of 'graphic organization', defined as 'a scaffold in the form of a picture, diagram or chart which guides the learner's thought', is useful here (Newton, 2012, p.52). The first step in the process of constructing a graphical representation of the score involves opening a digital file in music processing software. Adobe Audition® software can be used to display the digital file of the first movement of Beethoven's *Fifth Symphony*, not an uncommon set piece of music for students (hereafter referred to as 'the Beethoven'). (Other music editing programmes which could be used include Garageband®, Audacity®, and Cubase®). Figure 1 is a screenshot of the digital file. The screenshot is like a graph with the x-axis representing time and the y-axis representing amplitude. The two rows represent the left and right channels of the stereo recording. Features of structure are apparent due to the differences in amplitude of the waveform. For example, the cursor (in colour in on screen) is currently at the beginning of the development section (2 min. 32s), and is followed by a quiet passage.

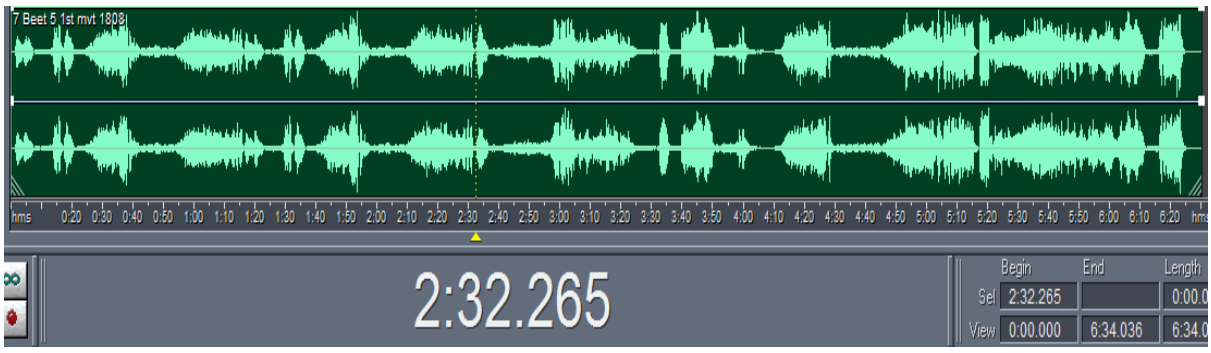

Figure 1: Digital file of the first movement of Beethoven's Fifth Symphony ('the Beethoven').

Aeillo and Williamon (2002) advise students of analysis to use different colours to highlight recurrent themes or voices. Here, colours identified features of key and sonata form structure so the student does not have to recall them, reducing mental burden and creating more capacity for analytical thinking on the mind's sorting table. Drawing a chart clutters the sorting table, muddles the purpose, and restricts learner interaction with the material whilst the coloured graphic representation focuses on purpose, and allows interaction and progression to the level of 'chunking' thinking into groups, just as a chess master remembers sequences of moves whilst a novice has to consider each move, one at a time.

Figure 2 shows the graphic representation with music in the keys of C minor (purple), E flat major (red), and C major (green), including the highlighting of the development where key is unstable (2.30 to 3.45). The harmonic structure of 'the Beethoven' is of a stunning simplicity (Cook, 1994) which makes it particularly useful for modelling sonata form.

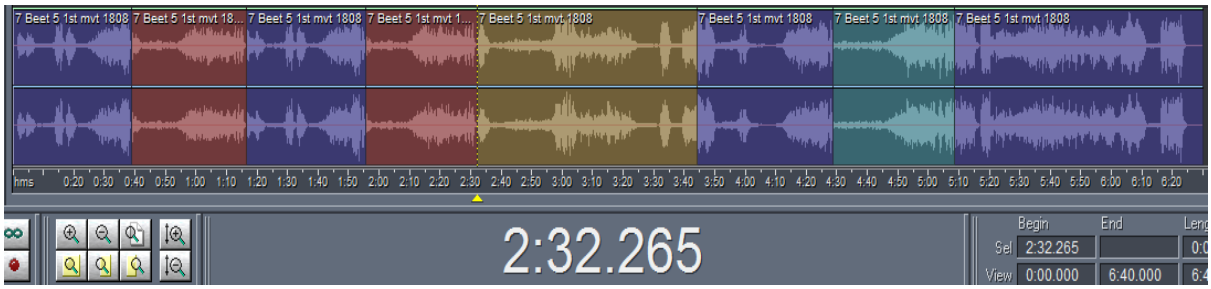

Figure 2: Graphic representation of 'the Beethoven' (Beethoven's Fifth Symphony) in which colours were used to indicate key and structure.

Listening to the Beethoven while following the Bärenreiter Urtext edition of the score requires 15 page turns, including a return to the first bar because the exposition is repeated in full. For some students this becomes an exercise in turning the page at the same time as a neighbour. Presenting the image on a screen reorganises the material so that it plays chronologically from left to right in a single movement in the manner of an iPod® playhead and this eases the task. Some students find static graphs hard to interpret when some relationships do not transfer directly to those on the graph (Gerber, Boulton-Lewis & Bruce, 1995), but in this study they did. The first movement of Haydn's *Symphony No. 104* has a slow introduction which takes up only 8% of the printed score but 24% of the recording. This non-linear relationship can be confusing but a graphic representation of the form of figure 2 can help students understand the temporal structure of the work as well as the harmonic structure. Presenting data in this way also allows students to attend to data simultaneously in the manner argued by Hegel. It also allows them to develop a sense of expectancy. In music, expectancy comes from hearing styles repeatedly so even a non-musically trained ear can anticipate what may happen next in popular music, but this takes a trained ear for more complex or longer structures, as in the idiom of classical music (Hodges & Sebald, 2011). Displaying anticipation requires developed musical understanding just as prediction does in the sciences.

Finally, the graphic representation creates opportunities for what may be called listening in the 'mind's ear' (Newton & Newton, 2006). The development of 'inner hearing' during musical training is worth fostering (Clark, Williamon & Aksentijevic, 2012, p. 353). For instance, Bailes' study of music undergraduates found that 32% of music students were imagining music when not listening to it or performing it (see Clark, Williamon & Aksentijevic, 2012, p. 354). The graphic representation can be used as a tool for interacting

with the piece by promoting 'audiation'. Audiation is Lehmann's term for the internalisation of musical sound but he also describes 'visualisation' where a performer memorises the compositional structure of a piece and this may include an image of the score. In addition, some musicians may have developed a 'photographic ear' which allows them to access individual notes of memorised or recently heard music (again, see Clark, Williamon & Aksentijevic, 2012, p. 354). By audiating extracts internally, students can consider features of key, structure and instrumentation without needing to listen to the whole movement or use the score, especially if their graphic representation is annotated.

The approach used and ethical considerations

A learning conversation took place with Jenny, the ten-year old participant in the study. While Jenny is not of secondary school age (normally 11 years of age or more), it was considered that her strong ability as a performer coupled with her lack of experience in analysis would resemble that of such a student. A question sheet was used to record observations (Appendix A). The conversation began with discussing sonata form before exploring the Beethoven with the orchestral score and then the graphic representation. Finally, to assess the extent to which Jenny could apply her knowledge of sonata form, the overture to Mozart's *Marriage of Figaro* was discussed. Jenny is more familiar with other symphonies by Beethoven and Mozart's opera *The Magic Flute*, and although she has attended performances of both pieces used in the conversation she does not have what might be considered a deep understanding of these works.

The participant's anonymity has been preserved in the presentation of the findings. The study has adhered to all ethical obligations as suggested by Rubin and Rubin (1995) and overseen by the University. The participant was informed about the intended use and

purposes of the research and she was ensured that her participation was fully voluntary and that anonymity would be preserved.

Findings

At the beginning of the conversation, Jenny's understanding of structure was weak. Her initial explanation used terms such as 'skeleton' and 'the beat'. However after using the table (see Appendix B, Prompt 1) to discuss sonata form, her response was:

"Different parts in the music put together in a certain way. Things can be repeated. Basically, what pieces make the jigsaw."

Her only reference to the temporal nature of structure was in acknowledging that sections, such as the exposition in sonata form, can be repeated. At this point the score was followed while listening to the recording. Similar problems to those experienced by examination course students were encountered:

"You couldn't figure out how fast it was being counted. You didn't know which instrument was playing. By the time you'd figured it out it's on to the next part."

Next, the graphic representation was introduced (Appendix B, Prompt 2). Interestingly, Jenny noticed the changes in amplitude first and immediately related these to volume before commenting on the use of colours to highlight the different sections of the work. However when asked if she could sing the blue section she could recall the first subject material. Older secondary students are often asked to identify whether a passage of second subject material comes from the exposition or the recapitulation. This is demanding because, while being similar in terms of melodic material, the music in the recapitulation returns in the tonic key rather than the key that was heard in the exposition, requiring an

understanding of context to make a correct identification. Jenny was asked what she thought the difference between the red and green sections was:

"*Is it the coda? (pause). Oh yeah, it's because it's changed to the tonic key.*"

This response indicates a moderate understanding of this issue. Jenny was able to recall that different colours represented different keys, and she did not incorrectly state that the second subject in the recapitulation is in C minor - she called it 'the tonic'. For deep understanding to be evident she would need to make explicit that the key here is C major.

Next Jenny was played short extracts and asked to point out on the graphic representation where in the piece she thought the music came from and to state the key at this point. She identified the development section and the coda and used the sonata form table as a prompt to state the keys. Differentiating between the second subject in the exposition and the recapitulation, however, caused confusion as she failed to identify either as the second subject. This may be because the passage begins with melodic material based on the familiar opening theme, and as Hodges and Sebald (2011) pointed out, melody is the most recognisable element of the music, and so the listener is drawn there initially.

In order to observe the highest level of Jenny's understanding, the final part of the conversation used Biggs and Collis' (1982) concept of the 'extended abstract' application of learning in a new situation. This could happen in two ways: by creating a new graphic representation of further sonata form movements, and by applying this understanding to composing in sonata form. Students are generally not required to compose using sonata form but it is a proven way of successfully approaching composition. Our conversation used the first approach; it did not go beyond using the initial digital file to explore features of structure.

In discussing the digital file of *The Marriage of Figaro*, Jenny was able to identify the coda easily by referring to the amplitude on the screen without hearing the music (outlined in the rectangle in figure 3). When asked if any of the music was repeated she noticed the second subject passages which appear twice in the overture (outlined in the ellipses).

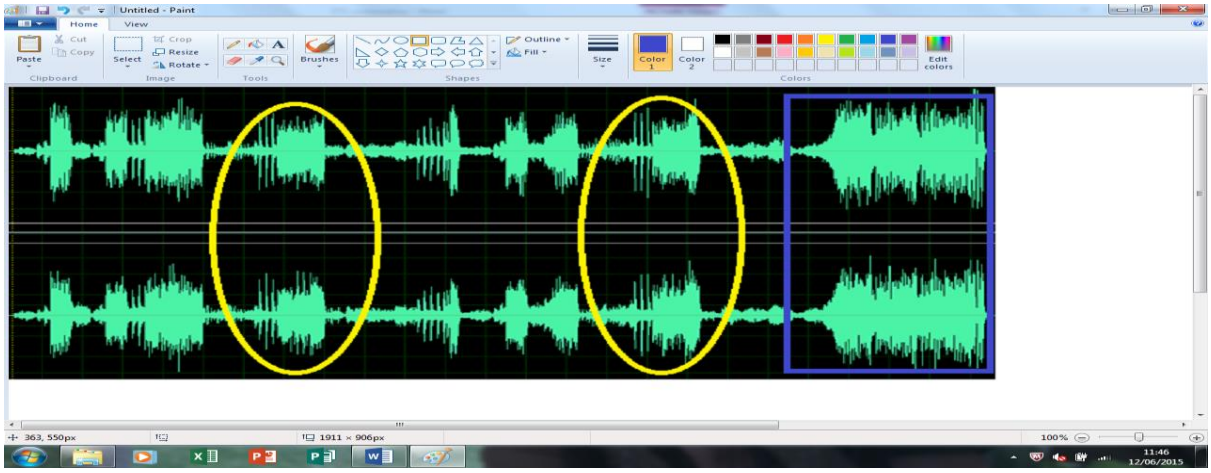

Figure 3: Annotated digital file of *The Marriage of Figaro*.

Probing the nature of the key of the second subject followed. Jenny had been informed that the overture was in D major and when asked to suggest a key for the second subject she replied:

> *"Could be the relative minor, but I don't know what it is."*

This points to the application of knowledge from earlier in the conversation, but Jenny does not have sufficient understanding to work out the relative minor of D major.

The Marriage of Figaro was chosen because it would take a high level of understanding to recognise the fact that the exposition is not repeated, and placing this significance in the context of the sonata form tradition would require deep understanding. The question, 'Do you notice any big differences between this sonata form movement and the Beethoven?'

needed adapting in order to elicit a response. When asked, 'How many times can you see the second subject', Jenny replied:

"Twice, which means that it isn't repeated at the beginning."

'It' of course means the exposition. In spite of not using the appropriate terminology, the inference is correct. Jenny does not have knowledge of enough sonata form movements to understand that Mozart's choice to omit the repeat of the exposition makes it an exception, however, as Jenny had no previous knowledge of sonata form and only a vague understanding of structure, her ability to recognise this feature suggests that she has acquired and applied an understanding of sonata form using graphic representation very quickly.

Conclusion

The study aimed to shed light on the following question: Can the understanding of analysis of sonata form movements be deepened by using graphic representations? By colouring sections of the digital file, a graphic representation was used which allowed Jenny to identify accurately what key the music was in for most sections of 'the Beethoven'. To satisfy the requirements of an examination this may appear to display a sufficient understanding, but we must remember that Jenny was recalling recently discussed material (so was still on the mental sorting table), and had a prompt (Prompt 1) to refer to. However, Jenny was able to apply her knowledge of sonata form in the final part of the conversation by identifying that Mozart's overture did not repeat the exposition.

There is potential for developing the use of colour as an interactive tool for analysis in graphically represented pieces of music. In the learning conversation, the digital file of the Mozart could have been edited by Jenny to create her own graphic representation in an

interactive manner. Jenny was asked what colour she might have chosen for the exposition. Initially she indicated that all sections should be the same colour as those in the graphic representation of the Beethoven. When told she could choose her own colours she responded:

"Perhaps a prime colour because it's a part of the piece that's used a lot. The development could be different colours."

Jenny's association of a primary colour with the tonic key and first subject suggests that she understands the importance of the key and musical material in terms of structure. Jenny's initial response to the question of colour raises an interesting issue. Once a colour has been chosen for something, does that colour continue to represent that concept, and would changing it cause dissonance? As an ex-faculty leader in a secondary school, the first author recollects the time when he annotated a print out of the faculty timetable and he used coloured pens to represent different year groups. Those pens were chosen because they were to hand, but those colours remained forever unchanged in subsequent electronic versions of the timetable. Perhaps, once the connection is made, it is difficult to break.

Implications for music teacher education

In terms of format, a coloured graphic representation printed on a single A4 sheet may be of more use to a student than a photocopy of the complete score. It provides a succinct way of accessing the data which can be annotated by the student or by a group if projected onto a whiteboard. It can be used as a tool to facilitate audiation and as such can condense the internal listening experience in the manner described by Clark, Williamon and Aksentijevic (2012, p. 359) in their discussion of 'mental chronometry', and, therefore, allow the student to attend quickly to features of structure and key internally. The potential for a more rapid

processing of the listening material suggests that interactive technology can usefully complement classroom activities, adding depth and breadth to the music curriculum (Enz, 2013). Furthermore, Todd and Mishra (2013) reviewed the literature on what constitutes meaningful listening instruction and concluded that directed listening activities that add a visual component to listening helps students make concrete musical connections. If students feel well-supported in making these connections, they are more likely to view their efforts as leading successfully to the resolution of tasks, such as problem-solving, and the maintenance of high standards, enhancing a mastery goal orientation to music learning (Hruska, 2011).

The need for access to the specialist software could limit the potential use of the graphic representation, although a file showing the playing of the graphic representation in real time may be uploaded onto www.youtube.com which would allow access through any computer, albeit without the same potential for interaction and editing. It should also be added that the graphic representation supports the use of scores and is not intended to replace them. For those students who were identified as having difficulties interpreting an orchestral score, a graphic representation may be used to avoid the problem of data smog, but for more advanced students, the score must remain the principal document for analysis.

It must also be acknowledged that a conversation with one learner does not provide data which lends itself to wide generalisation (Johnson & Christensen, 2008). It does provide, however, an useful insight into the potential use and benefits of presenting a musical score in a graphic representation. This is what readers may be able to relate and adapt to their own needs and circumstances, and put to good use (Bassey, 2000).

Jenny had previously heard the Beethoven and Mozart used in the conversation, but she did not *know* the pieces to the same extent she knows *Finlandia*, having performed it. This is an

interesting issue. Simon Frith illustrates the need to differentiate between 'hearing' and 'listening' by referring to the 'soundtrack to life' (see Hargreaves, Hargreaves & North, 2012, p. 156). To this should be added, 'knowing' and 'understanding'. In the current educational climate, repetition of a learning activity can be frowned upon, and yet it is essential that repeated listening is necessary to internalise and understand the music. The problem of iteration is overlooked by the Bloom and SOLO taxonomies: 'hierarchies can tempt us to overlook an iterative process in thinking', and it is necessary to consider how understanding 'varies in degree' (Newton, 2012, p. 127). Although we found that graphic representation can be a useful tool for deeper understanding of the analysis of sonata form, iterative listening remains important in order to gather the 'facts' before we can begin to relate them. No form of representation is going to support students meaningfully if they do not *know* the music. Repeated listening must be a prerequisite if deep understanding is to take place (Levin, Pargas & Austin, 2005). Jenny's understanding of the Beethoven will deepen with exposure through a variety of contexts. In doing so, she will not just be living with Beethoven for a day or two, but for her whole life (Cook, 1994).

References

Aeillo, R & Williamon, A. (2002). Memory. In Parncutt, R. & McPherson, G. (eds.) *The Science and Psychology of Music Performance* (pp. 167–181). New York: Oxford University Press.

Bassey, M. (2001). A solution to the problem of generalisation in educational research: Fuzzy prediction, *Oxford Review of Education*, *22*(1), 5–22.

Biggs, J.B. & Collis, K.F. (1982). *Evaluating the quality of learning: The SOLO taxonomy (structure of the observed learning outcome).* London: Academic Press.

Clark, T., Williamon, A. & Aksentijevic, A. (2012). Musical imagery and imagination: The function, measurement, and application of imagery skills for performance, in Hargreaves,

Cook, N. (1994). *A guide to musical analysis*. Oxford: Oxford University Press.

Edens, K.M., & Porter, E.F. (2001). Promoting conceptual understanding through pictorial representation. *Studies in Art Education*, *42*(3), 214–233.

Eisner, E.W. (1993). Forms of understanding and the future of educational research. *Educational Researcher*, *22*(7), 5–11.

Enz, N.J. (2013). Teaching music to the non-major: a review of the literature. *Update: Applications of Research in Music Education*, *32*(1), 34-42.

Folkestad, G. (2012). Digital tools and discourse in music: the ecology of composition. In Hargreaves, D.J., Miell, D.E. & MacDonald, R.A.R. (eds.) *Musical imaginations: Multidisciplinary perspectives on creativity, performance and perception* (pp. 193–205). Oxford: Oxford University Press.

Forte, A. & Gilbert, S. E. (1982). *Introduction to Schenkerian analysis*. New York: W. W. Norton and Co.

Frith, S. (2012). Creativity as a social fact. In Hargreaves, D.J., Miell, D.E. & MacDonald, R.A.R. (eds.) *Musical imaginations: Multidisciplinary perspectives on creativity, performance and perception* (pp. 62–72). Oxford: Oxford University Press.

Gerber, R., Boulton-Lewis, G. &Bruce, C. (1995). Children's understanding of graphic representation of quantitative data. In *Learning and Instruction*, *5*(1), 77–100.

Hallam, S., Creech, A., Sandford, C., Rinta, T., Shave, K. & McQueen, H. (2009). *Survey of Musical Futures*. Institute of Education, University of London: Paul Hamlyn Foundation.

Hargreaves, D. J., Hargreaves, J.J. & North, A.C. (2012). Imagination and creativity in music listening. In Hargreaves, D.J., Miell, D.E. & MacDonald, R.A.R. (Eds.) *Musical imaginations:*

Multidisciplinary perspectives on creativity, performance and perception (pp. 156–172). Oxford: Oxford University Press.

Harris, Y. (2011). *Scorescapes: on sound, environment and sonic development*. Academy for Creative and Performing Arts, Faculty of Humanities, Leiden University.

Hodges, D.A. & Sebald, D.C. (2011). *Music in the human experience: An introduction to music psychology*. London: Routledge.

Hruska, B.J. (2011). Using mastery goals in music to increase student motivation. *Update: applications of research in music education*, *30*(1), 3-9.

Johnson, B. & Christensen, L. (2008). *Educational research: Quantitative, qualitative, and mixed approaches.* 3rd edn. London: Sage.

Levin, A.R., Pargas, R.P. & Austin, J. (2005). Appreciating music: an active approach. *New Direction for Teaching and Learning*, *101*, 27-35.

Lissa, Z. (1968). The temporal nature of a musical work. *The Journal of Aesthetics and Art Criticism*, *26*(4), 529 – 538.

McGregor, D. (2007). *Developing thinking developing learning. A guide to thinking skills in education.* Maidenhead: Open University Press.

Moseley, D., Baumfield, V., Elliott, J., Gregson, M., Higgins, S., Miller, J., & Newton, D. P. (2005). *Frameworks for thinking: A handbook for teaching and learning*. Cambridge: Cambridge University Press.

Newton, D.P. (2012). *Teaching for understanding: What it is and how to do it.* 2nd edn. London: Routledge.

Newton, D.P. & Newton, L.D. (2006). Could elementary textbooks serve as models of practice to help new teachers and non-specialists attend to reasoning in music? *Music Education Research*, *8*(1), 3-16.

Nickerson, R.S. (1985). Understanding understanding. *American Journal of Education, 93*(2), 201–239.

Some Like it Hot (1959). Directed by Billy Wilder [DVD]. Los Angeles: Metro-Goldwyn-Mayer Studios Inc.

Rubin, H.J. & Rubin, I.S. (1995). *Qualitative interviewing: the art of the hearing data*. Thousand Oaks: Sage.

Storr, A. (1992). *Music and the mind*. London: Quality Paperbacks Direct.

Swanwick, K. (1991). *Music, mind and education*. London: Routledge.

Todd, J.R. & Mishra, J. (2013). Making listening instruction meaningful. *Update: Applications of Research in Music Education*, *31*(2), 4-10.

Appendix A: Learning conversation questions

1. What does structure mean in music?

- Can you explain what sonata form is?
- What are the sections called?

2. Let's listen to the Beethoven with the score.

- How did you find that?
- Did you have any problems?

3. Now let's listen to the Beethoven but this time following this image of the sound on the screen (give Handout 2 to participant).

- Before we start what do you notice?
- Can you predict what the music in the second blue section sounds like? Can you sing it to me?
- Can you explain what the difference between the red and green sections is?

4. Now look away from the screen. I'm going to play you some short passages. Using your sheet can you point to where you think we are on the coloured image? What key is the music in at this point?

- (play the development section)
- (play the coda)
- (play the second subject in the recapitulation, then the exposition)

5. Now let's look at a sound file of the overture to *The Marriage of Figaro* on the screen. It's also in sonata form and in D major.

- Do you notice any music which is repeated? Can you show me?
- Can you suggest a key for the second subject?
- Do you notice any big differences between this sonata form movement and the Beethoven?

Appendix B: Prompt sheets used in the learning conversation.

Prompt 1

Exposition **(repeated)**		Development	Recapitulation		Coda
1st subject	2nd subject	Development of 1st and 2nd subjects	1st subject	2nd subject	
Tonic key	Related key	Various keys	Tonic key	Tonic key	Tonic key

Prompt 2