Act Sing Play

A research evaluation of the instrumental and vocal learning by pupils in participant 'Act, Sing, Play' Primary schools across England

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Executive Summary

Act Sing Play was a programme of arts provision for pupils in Year 2 of their Primary careers. The programme offered three strands of tuition: (i) strings, (ii) vocal, and (iii) drama. Creative Futures (UK) Limited delivered the programme over the course of the academic year September 2013 to July 2014. Initial consultation with members of the research team from the UCL Institute of Education and experts within the field fed into the initial development process of the curricula, with each strand's design and content being developed specifically for the project. The Education Endowment Foundation provided funding for the *Act Sing Play* intervention and Creative Futures funded the research evaluation reported here.

The aims of this research evaluation were threefold: (i) to measure the impact of the music components (strings and vocal tuition) of the *Act Sing Play* programme on the musical development of the participating pupils; (ii) to measure the extent to which participation in any one of the three strands impacted upon pupil's perceptions of themselves in relation to wider aspects of their school experience; and (ii) to explore aspects of effective practice amongst the strings and vocal practitioners involved in the project.

Within each participating school, one class of pupils were randomly divided into three groups and each subgroup was allocated one of the three arts strands. Subgroup size was approximately ten pupils to one specialist tutor. Each subgroup received one strand of the arts provision for the duration of an academic year. Weekly sessions (for a total immersion of 32 weeks) were timetabled so that each of the three strands of provision took place simultaneously. Each session lasted 45 minutes. Within each class, one subgroup of pupils participated in stringed instrument lessons (choosing either violin or cello); the second subgroup participated in vocal lessons (loosely based upon the Kodaly method), whilst the third subgroup participated in drama lessons.

Within the design of the intervention, the drama strand acted as an active control, inasmuch as the subgroup of participating pupils were involved in an arts-based provision for the same period and duration of immersion as their music-based peers. As a result, pupils in the drama strand participated in only one aspect of the research evaluation (i.e. to measure the extent to which participation in any one of the three strands impacted upon pupil's perceptions of themselves in relation to wider aspects of their school experience).

The research evaluation involved 909 pupils across 19 participating Primary schools in four different geographical regions and urban contexts in England (Coventry, Essex, East Sussex and Hounslow). Data was gathered from 301 pupils allocated to the strings subgroup, 304 pupils allocated to the vocal subgroup and 304 pupils allocated to the drama subgroup.

For the pupils in the vocal tuition subgroup, measures used included an assessment of developmental singing competency and vocal behaviour. For the pupils in the strings tuition subgroup measures used included a tutor assessment measure of musical behaviours and engagement. All pupils (across strings, vocal and drama subgroups) completed a 7-point Likert scale pupil questionnaire covering aspects of musical identity, learner identity and self and social inclusion.

The findings of the research evaluation would suggest that:

- The mean singing assessment scores at pre-intervention would suggest that **vocal development was at an early stage for many of the Year 2 pupils involved in the project**. Following matched pair comparisons of pre-intervention and post-intervention assessments of the pupils who took part in the vocal subgroup (n=240) of the *Act Sing Play* programme, **statistically significant improvement was evidenced at song singing in post-intervention measures**. As has been commonly reported elsewhere in the research literature, there were sex differences in the singing assessments, with female pupils (n=125) scoring higher than males (n=115).
- The instrumental tutors' assessment of musical behaviours show that **pupils made significant progress in their instrumental learning throughout the duration of the Act Sing Play programme**, with significant learning gains in the first term that were **extended across the full academic year** (again, achieving statistical significance). This would suggest that longer immersion periods (such as this year long programme) are likely to contribute to greater instrumental competency, as reported elsewhere.
- The analyses of the pupils' attitudinal and self-identity questionnaires suggest that the **Year 2 pupils were broadly positive about all of the aspects of their school and musical lives and that this positivity was maintained throughout the year,** with broadly similar mean ratings given at post-intervention as pre-intervention.

1. A review of evidence

1.1 Structured musical experiences and far transfer effects

A considerable amount of research has been dedicated to investigating if, and how musical abilities might influence other cognitive functions (e.g., Cheek and Smith, 1999; Butzlaff, 2000; Moreno et al., 2011; Rickard et al., 2010; Schellenberg, 2011). Musical experience develops through four main processes: (i) enculturation – being exposed to the sounds and musics of the maternal culture; (ii) informal learning, such as with peers and siblings; (iii) non-formal learning, such as in community settings outside school; and (iv) formal, explicit musical instruction. Whilst enculturation nurtures and improves basic auditory capacities and individual sensitivity to universal aspects of spectral and temporal structure, other kinds of musical experiences utilise and support the development of a set of attentional and executive functions by refining perception and production skills (e.g., Hannon and Trainor, 2007).

Musical experience and education (broadly conceived to embrace informal, non-formal and informal contexts) involve a number of attributes that may prove beneficial for other areas of cognition and learning, such as daily practice, periods of sustained attention, memorisation of musical passages, reading musical notation, on-going mastery of technical skill, and learning about conventions that govern musical structure and the expression of emotions in performance (*cf* Schellenberg, 2004). Research has evaluated possible 'transfer' effects of sustained musical experience (including training) by investigating broad cognitive abilities such as intelligence and reading skills (whilst recognising that these are socio-located and socio-culturally defined), as well as more specific domains including auditory imagery, creativity, and visuospatial abilities, in both children and adults.

The following discussion considers the various domains in which research reports 'far transfer' effects of music training, as well as proposing potential underlying mechanisms for these, including superior inter-hemispheric transfer time and auditory brainstem responses. Essentially, although the underlying neural mechanisms are complex and difficult to lineate clearly, there is an emergent body of research that suggests that sustained and focused musical experience, such as involved in instrumental learning, can provide benefits for the development of cognitive abilities in a range of domains and modalities.

1.2 Structured musical experience and aspects of cognitive performance

The effect of sustained and focused musical experience on general cognitive performance has been investigated by a number of researchers. Schellenberg (2004) conducted a study in which a large group of children were randomly assigned to music lessons (vocal or keyboard), drama lessons, or no lessons. 'General intelligence' was measured both before

and after the 36-week lesson period using the Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991). Although the effect size was small, statistical analyses confirmed that the students who performed best in the full-scale IQ[i] test were the ones who had received music lessons. However, a number of researchers have questioned the replicability of Schellenberg's (2004) study, arguing that the statistical methods used to analyse the results were not suitable. For example, Schellenberg (2004) collapsed scores from the keyboard and voice groups, yet the combination of groups was not justified theoretically because the teaching method used for the two groups was very different (Steele, 2005). Whilst the keyboard lessons involved a customary form of musical instruction, the vocal lessons employed the 'Kodaly method,' which emphasises singing, hand signs, clapping, and other sequenced activities, some in accompaniment with music. A reanalysis of the original uncombined groups produced results that had small effect sizes and were statistically insignificant (Steele, 2005), therefore questioning the generalisability of Schellenberg's (2004) findings.

Bilhartz, Bruhn and Olson (1999) assessed the effects of focused early musical experiences on cognitive development in a large number (n=71) of 4-6 year olds. One half of the sample participated in a 30-week, 75-minute weekly, parent-involved music curriculum, while the other half acted as a control. The findings demonstrated that alongside improved musical abilities, those in the music group also showed improved performance on the Bead Memory subtest of the Stanford-Binet Intelligence Scale, even when scores were controlled for sex, ethnicity, parental education and economic class. Bilhartz et al. (1999) concluded that their results provided support for an association between early music instruction and spatial-temporal reasoning abilities. They concluded that the link between music treatment and Bead Memory scores is of particular importance because this subtest measures both visual imagery and sequencing strategies. These mental processes have been theorized to require the same neural firing patterns that are needed in the performance of musical activity. The evidence of this study supports this theory: children trained to produce music vocally and on a glockenspiel – sequential training that uses and develops kinaesthetic, aural, and visualization skills – become better able to perform the abstract reasoning tasks measured by the SB Bead Memory subtest. Furthermore, Costa-Giomi (1999) conducted a longitudinal study to investigate the effects of three years of piano instruction on the cognitive development of Grade 4-6 children. Those children who had attended piano lessons obtained higher spatial abilities scores than the control group, following both the first and second year of instruction (using the Developing Cognitive Abilities Test). However, the groups did not differ in general or specific cognitive abilities after 3 years of instruction. The treatment did not affect the development of quantitative and verbal cognitive abilities. Costa-Giomi (1999) concluded that although music can improve cognitive skills, especially spatial abilities, these

[i] IQ remains a contested subject. See for example Marks (2010) argument that variations in IQ scores are an artifact of differences in literacy skills.

improvements might only be temporary. In comparison, Cheek and Smith (1999) tested school grade 8 students with the Iowa Tests of Basic Skills (ITBS) Mathematics element. Students who had music lessons for two or more years performed significantly better than those who did not had not had such experience. Hille, Gust, Bitz and Kammer (2011) tested 194 boys in grade 3 in terms of reading, spelling and non-verbal intelligence. Results were correlated with parental information relating to musical activities. Non-verbal intelligence and spelling was higher in those boys with a prior history of musical instruction.

Although sustained and focused musical experience and cognitive abilities are thought to be associated, little research has looked into whether this association is mediated by another variable, such as executive function. Schellenberg (2011) compared the IQ and executive function performance of so-called musically trained and untrained 9-12 year olds, and found that although 'musicians' demonstrated higher IQ than non-musicians, there was no association between musical training and executive function. He concluded that the association between music training and IQ was not mediated by executive function. Hargreaves and Aksentijevic (2011) argue that the interacting variable that mediates the relationship between music and cognition is complex and, as a result, difficult to disentangle. Music embraces a spatio-temporal domain that engages both hemispheres and processes structural and temporal information together and, according to Hargreaves and Aksentijevic (2011), it is the complexity of this processing that facilitates the association between musical training and general intelligence.

1.3 Structured musical experience and aspects of literacy

Research suggests that some of the skills used in language processing are similar to those used in music perception (Lamb and Gregory, 1993). The domains involved in the acquisition of both language and music share common features: both are auditory, highly patterned and internally consistent (Saffran, 2003). Neuropsychological evidence suggests that speech and music may share some cortical areas and mechanisms (Patel and Peretz, 1997; Patel 2011). Findings such as these have motivated research into the effects of musical instruction on reading abilities. Butzlaff (2000) claims there are a number of reasons as to why sustained and focused musical experiences may improve reading abilities in children. Firstly, both music (in part) and reading involve formal written notation, which is read from left to right, and involves the mapping of written symbols to specific sounds. Secondly, both domains develop auditory sensitivity; reading skills require sensitivity to phonological distinctions, while music skills require sensitivity to tonal distinctions. Furthermore, reading song lyrics results in an engagement with written text. As song lyrics are often predictable and repetitive, they may provide opportunities to develop reading skills using an alternative approach. To test this, Butzlaff (2000) conducted two meta-analyses of empirical studies to investigate the association between musical instruction and reading abilities. A meta-analysis of 29

correlational studies suggested a significant, positive correlation between musical instruction and standardised reading test scores. However, although there is evidence for a relationship between music and reading, no causal conclusions can be drawn from correlational research. Butzlaff (2000) also conducted a meta-analysis involving six experimental studies, which yielded no reliable effects of musical instruction on reading abilities. However, these results were limited by the very small number of studies used in the meta-analysis, so no comprehensive conclusions can be made. Nevertheless, in related research, Goswami and colleagues have investigated aspects of acoustic processing (rise time) as an underlying auditory difficulty commonly found in dyslexic children (e.g., Goswami, 2012; Goswami *et al*, 2012). As rise time is an important acoustic cue for rhythmic timing, there is some evidence to suggest that sustained performance of music can mitigate aspects of developmental dyslexia, at least in adult musicians (Bishop-Liebler, Welch, Huss, Thomson and Goswami, 2014).

A number of studies have examined more specific components of reading abilities, such as word decoding, reading comprehension, and phonological awareness. Corrigall and Trainor (2011) investigated whether the number of years spent in musical instruction could predict word decoding and reading comprehension skills in a sample of 6-9 year olds. Although there was no association between music instruction and word decoding skills, length of music instruction predicted reading comprehension performance even after controlling for age, socioeconomic status, auditory perception, full-scale IQ and the number of hours spend reading per week (Corrigall and Trainor, 2011). Anvari, Trainor, Woodside and Levy (2002), investigated the association between phonological awareness, music perception skills and early reading skills in a large sample of 4-5 year olds, and found that music skills correlated significantly with phonological awareness and reading development. Furthermore, music perception skills were able to predict reading ability, even when phonological awareness and other cognitive abilities were accounted for. Anvari et al. (op.cit.) propose that shared auditory mechanisms may underlie the association between phonological awareness and music perception – a position that is support by Patel's recent writing (Patel, 2011). While phonological awareness requires the segmentation of speech into component sounds, with recognition across variations in tempo, pitch, speaker and context (Stahl and Murray, 1994), the perception of music requires the segmentation of a tone stream into relevant units, with recognition across variations in pitch, tempo, performer and context (Anvari et al., op.cit.). The finding that music perception skills were able to predict reading even after the variance shared with phonological awareness was removed suggests that phonemic awareness and music perception tap processes needed for reading that involve both shared, as well as independent auditory mechanisms.

Wong, Skow, Russo, Dees and Kraus (2007) investigated the role of musical instruction on subcortical encoding of linguistic pitch patterns, and found that musical experience may sharpen basic auditory circuitry. The brainstem encoding of linguistic pitch was examined in

musicians with at least six years of sustained musical training beginning before 12 years of age, and non-musicians with less than 3 years of musical training. Wong et al. (op.cit.) found that brainstem pitch tracking and musical experience were positively correlated, demonstrating the effects of long-term musical training on linguistic pitch encoding at the brainstem. Wong et al. (op.cit.) suggest that this encoding may reflect a positive side effect of context-general corticofugal tuning, which enhances relevant auditory functions subserved by the brainstem. As the mechanisms that convert sound waves into discrete sound categories in music and language are known to overlap, superior encoding at the brainstem could provide a neurophysiological explanation for musicians' higher language-learning abilities.

Kraus (2011) further investigated auditory brainstem responses to determine whether this basic brain mechanism was the biological processing basis that underlies the perceptual advantages found in musicians. The auditory brainstem response represents a reconstruction of the basic elements of speech and music, such as pitch, timing and timbre (Kraus, op.cit.). Kraus claims that musicians produce larger and more accurate auditory brainstem responses than non-musicians, which reflects enhanced neural coding of sound waves. Strait and Kraus (2011) proposed that musical training benefits the cortical mechanisms that underlie selective attention to speech. Musicians were found to have a greater neural proficiency for selectively engaging and sustaining auditory attention to language, indicating a potential benefit of music for auditory training. Strait, Hornickel and Kraus (2011) used auditory brainstem responses to investigate the relationship between subcortical processing of speech regularities, music aptitude and reading abilities in children. They found that auditory brainstem responses predicted reading and musical aptitude in children, which suggests that there may be a common brain mechanism underlying reading and music abilities that is related to neural sensitivity to regularities in auditory input (Strait, Hornickel and Kraus, 2011). As music training engages attention and memory skills in the auditory domain, it may result in more precise tuning of brainstem responses to incoming signals. Musical training bolsters auditory-specific cognitive skills, such as auditory short-term memory and the ability to perceive speech signals from competing background noise (Strait and Kraus, 2011). It may be through the strengthening of this basic brain mechanism that music training contributes to language development.

1.4 Structured musical experience and aspects of numeracy

There is empirical and neuroscientific evidence to suggest that there is cognitive transfer from musical learning to mathematical learning. Several empirical studies from the late 1990s report a correlation between a pupil's musical learning and their mathematical skills. For example, Gardiner et al. (1996) designed a study with pupils achieving lower scores in mathematics than their peers. After nine months of structured musical experience, the pupils had exceeded the control group's scores. Cheek and Smith (1998,1999) reported that pupils

participating in instrumental tuition for two years or longer achieved higher marks in a standardised mathematics test than peers with no musical tuition or less than two years.

Neuroscientific evidence has suggested that the inferior parietal lobule may be the neural bases upon which mathematical ability emerged (De Schotten et al., 2005). Dealing with spatial cognition and visuomotor integration, the inferior parietal lobule enables the individual to assess threat by calculating the speed of the predator, an escape strategy and the necessary physical coordination to run away (Andersen, 2011). Music, in particular musical notation is spatial and, as a result, playing music from notation may activate the inferior parietal lobule, with repeated activity strengthening the neural connection within the region. The ability to play music from written notation requires visuomotor integration, as the individual must transfer visual stimuli into both gross and fine motor movement. Structured musical experience has been shown to improve visuomotor coordination (Brown, et al. 1981). In particular, the higher the level of visuomotor coordination, the higher their mathematical skills level (Sortor and Kulp 2003).

1.5 Structured musical experience and aspects of memory

Debate continues relating to the link between music training and aspects of memory: some studies suggest it is beneficial for verbal memory (but to a lesser extent for visual memory) whilst other studies report conflicting evidence (Roden, Kreutz and Bongard, 2012). Chan, Ho and Cheung (1998) suggested that music training in childhood may have long-term positive effects on verbal memory, and that those effects may be mediated by changes in cortical organisation. Research has shown that the left temporal lobe is associated with verbal memory, while the right temporal lobe mediates visual memory (Morris, Abrahams and Polkey, 1995). As the left planum temporale region has been found to be larger in musicians than non-musicians (Schlaug, Jaencke, Huang and Steinmetz, 1995), it is expected that the cognitive functions associated with this area would be better developed. In a study investigating the role of music training on verbal and visual memory, Chan, Ho and Cheung (1998) demonstrated that adults who had received music training before 12 years of age remembered significantly more words in a verbal memory task than those without music training. Furthermore, there was no difference between musicians and non-musicians on the visual memory task. Chan, Ho and Cheung (1998) concluded that the long-term benefits of music training on verbal memory are mediated by changes in cortical organisation. In later research, Ho, Cheung and Chan (2003), compared 90 boys aged between 6 and 15 years old who were learning a musical instrument with peers who had received no instrumental training. When matched for age, education level, socio-economic background and intelligence, the boys in the music group were significantly better at verbal (but not visual) memory tasks. In a follow up study a year later, Ho et al. (2003) compared children from the same cohort who continued with their music training with those who had discontinued (for at least 9 months

prior to the testing). Boys in the music training group significantly increased their verbal learning and retention performances. No increase was found in the group that had discontinued their musical training. Roden, Kreutz and Bongard (2012) tested the verbal and visual memory skills of three cohorts of primary school children, one of which received instrumental training, one natural sciences training and one acted as control. Children receiving instrumental tuition scored significantly higher in tests addressing verbal memory than the control group. In addition, the musically trained children continued to improve their performances over time, unlike the control and natural science group. They propose that musically trained children develop highly efficient memory strategies for materials (such as words) that are represented as auditory codes (Roden et al., 2012).

1.6 Structured musical experience and the social and emotional domains

The benefits of music can extend beyond cognitive abilities, to social and emotional domains (Hargreaves and Aksentjevic, 2011). According to Gerry, Unrau and Trainor (2012), musical acquisition, cognitive development and social interaction do not act as isolated systems. In an experiment involving 6-month olds, Gerry, Unraru and Trainor (2012) demonstrated that active music classes in infancy enhanced musical, communicative and social development. Infants were randomly assigned to two groups; active music, where they attended a one-hour interactive music class, or passive music, where they were exposed to background music during play. Those assigned to the active group showed lower levels of distress and superior social and communicative development than those in the passive group. Although this does not provide direct evidence for improved cognitive abilities, social and communicative development facilitates learning in other domains.

Furthermore, Schellenberg and Mankarious (2012) investigated whether musical training in childhood is predictive of emotional comprehension. The Test of Emotion Comprehension and a brief IQ test were administered to musically trained and untrained 7-8 year olds. The musically trained children demonstrated higher IQ and emotional comprehension, even when demographic variables were taken into consideration. However, further analysis revealed that the group difference in emotional comprehension disappeared when the IQ scores were held constant. This led Schellenberg and Mankarious (2012) to conclude that the non-musical associations of musical training may be limited to measures of intellectual ability.

1.7 Structured musical experience and imagery

More specific cognitive abilities such as auditory imagery have also been shown to be associated with musical training. Aleman, Nieuwenstein, Bocker and Haan (2000) compared the performance of musician and non-musician adults on three imagery tasks; musical

imagery, non-musical auditory imagery and visual imagery. Musicians demonstrated better auditory imagery than non-musicians for both the musical and non-musical auditory imagery conditions, whereas there were no group differences in visual imagery. Aleman et al (2000) concluded that musical training, which often involves auditory imagery, leads to more proficient processing of imagery representations in auditory cortical areas. Due to years of on-going practice, the proficient processing of such representations results in musicians developing enhanced general auditory imagery abilities.

1.8 Structured musical experience and visuospatial abilities

Furthermore, research has shown that music training can enhance visuospatial abilities. Brochard, Dufour and Despres (2004) investigated the effects of music training on visual perception and imagery abilities by measuring reaction times on a visuospatial perception task. Subjects were required to detect on which side of a horizontal or vertical line a target dot was flashed, and findings revealed that adult musicians performed this task significantly better than non-musicians. Brochard, Dufour and Despres (2004) identify better sensorimotor integration as the mechanism underlying the musicians' advanced performance. They claim that basic perceptuomotor abilities are greatly improved in musicians due to many years of daily practice. Furthermore, neural correlates of these abilities have been identified through neuropsychological research, with evidence pointing to functional and anatomical reorganisation observed in the motor brain areas of musicians (Schlaug, Jancke, Huang, Staiger and Steinmetz, 1995).

Further evidence for the beneficial impact of music training on visuospatial skills comes from a study investigating the differences between musicians and non-musicians on a line bisection task. Neurologically intact right-handers show an asymmetry of spatial attention such that when asked to mark the centre of a line, they mark about 2% of the true centre (Hausmann, Ergun, Yazgan and Gunturkun, 2002). This is known as right pseudoneglect (Bower and Heilman, 1980). However, research has shown that musicians perform line bisection tasks significantly more accurately that non-musicians (Patston, Corballis, Hogg and Tippett, 2006). In fact, musicians may even show a slight left pseudo-neglect, reflecting more bimanual coordination and balanced spatial attention (Patston et al, 2006). These findings suggest that musicians develop an increased ability for the left hemisphere to perform cognitive functions that are usually right-hemisphere dominant (Patston et al., 2006). The cognitive transfer effects of music therefore extend far beyond the auditory modality, to areas such as more balanced hemispheric processing and therefore improved spatial attention.

1.9 Structured musical experience and creativity

Gibson, Folley and Park (2008) compared frontal cortical activity and performance on creativity tasks in a group of musicians and matched control participants. They found that while musicians were able to solve more remote association tasks than non-musicians, there was no difference in the two groups when IQ and verbal fluency were accounted for. However, musicians showed enhanced divergent thinking in terms of the number of uses they could generate for common objects, even after co-varying out IQ and verbal fluency. Furthermore, musicians showed greater bilateral frontal activity during divergent thinking tasks compared with non-musicians. Gibson, Folley and Park (2008) propose that creativity is characterised by enhanced divergent thinking, which is supported by increased frontal cortical activity. Therefore, musical training may improve creativity by means of enhanced divergent thinking, which is mediated by increased frontal cortical activity (Gibson, Folley and Park, 2008).

It has been suggested that the more balanced processing between hemispheres may be attributed to enhanced inter-hemispheric transfer time (IHTT; Patston et al., 2007). Research has shown that normal, neurologically-intact individuals transfer information from the right to left hemisphere faster than from the left to right, for both verbal and non-verbal tasks. Patston et al (2007) used electrophysiological measures to compare the IHTT of musicians and matched controls, and found that the transfer speed of visual information across the corpos callosum was more equilateral in musicians than in matched controls. Furthermore, musicians showed no directional difference between transfer across the hemispheres. Patston et al. (2007) claim that the developmental changes caused by music training account for the superior neural development, and hence improved IHTT of musicians compared to non-musicians.

1.10 The outcomes of musical transfer research

The nature of cognitive transfer and the context within which it can occur have been the subject of considerable theoretical and empirical research for the past century (Barnett and Ceci, 2002). Practically, the outcome of musical transfer research can be relevant in the implementation of educational programmes and development of curriculum frameworks. This paper has reviewed the far transfer effects of structured musical experience to domains as broad as general intelligence and reading abilities, and as specific as phonological awareness, verbal memory, auditory imagery, creativity, emotional processing, linguistic pitch encoding and visuospatial abilities. Underlying mechanisms have been proposed, including sharpened basic auditory circuitry, superior encoding and more precise tuning of brainstem responses, better imagery representations in cortical auditory areas, increased cortical frontal activity, improved sensorimotor integration, and more balanced hemispheric processing through enhanced IHTT. Fundamentally, research consistently shows that musical training benefits the development of cognitive abilities in a range of domains and modalities, with

effects being more pronounced and long-lasting with more extended periods of musical training.

2. Act Sing Play: The intervention and evaluation

2.1 Act Sing Play: the impetus for the study

The *Act Sing Play* programme was initially designed in response to the Schellenberg research (2004)[ii] in which pupils that participated in music provision were reported to have higher IQ scores than peers who had participated in other activities. The subsequent analysis of the original work has subsequently been questioned (see Schellenberg, 2011; Steele, 2005; Hargreaves and Aksentijevic, 2011) but there remains a body of evidence that suggests that participation in music lessons may produce long-term gains in academic or cognitive performance (see discussion outlined in Section 1, above).

Unlike much of the previous research, Schellenberg (2004) randomly assigned the participating children to different treatment conditions thereby hoping to address the confounding variable that arts participation has been found to be positively correlated with family income (Steele, 2005). The *Act Sing Play* programme sought to implement a similar concept as the Schellenberg work, but with key differences. These included: (i) all participation was to take place during the school day (thereby reducing the potential for participating children to be those with caregivers who already value the arts); (ii) participation would be at no cost to the pupil, family or participating school; (iii) participation would involve all pupils within a class cohort, irrespective of individual educational needs; (iv) the number of participating children in each treatment condition would be increased; and (v) no passive control group.

2.2 Act Sing Play: an overview

The aim of the research evaluation[iii] reported here was to measure the impact of the music components (strings and vocal tuition) of the *Act Sing Play* programme on the musical development of the participating pupils. Overall, n=909 pupils participated from 19 schools across London, Essex, Sussex and Coventry. Of these, post-intervention data was available from n=825, which included n=269 strings and n=277 singing. Working parallel to (but

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[ii] Schellenberg (2004) investigated whether music lessons improved IQ scores in young children in a pretest-posttest design. Six-year-old children were assigned to one of four treatment groups: (i) keyboard instruction, (ii) Kodaly vocal instruction, (iii) drama instruction, or (iv) no lessons. The programme ran for 36 weeks during one academic year. A small, but significant difference in gain of 2.7 IQ points was reported when the results of both the keyboard and Kodaly groups were combined and compared with the combined results for drama and no lessons.

[iii] Ethical procedures followed guidance from the British Educational Research Association (BERA) in which all participation is voluntary, participants may withdraw at any time for any or no reason, all data are anonymised so that no individuals can be identified and all data are kept securely in password protected files.

independent of) this evaluation, NatCen (funded by the Education Endowment Foundation[iv]) undertook an evaluation to 'measure the impact of the music components of the Act, Sing Play programme on the maths and literacy attainment of participating pupils, a subgroup of whom were eligible to receive Free School Meals (see concluding comments at the end of this report). The evaluation was based on the hypothesis that participation in high quality music instruction promotes cognitive development which leads to greater educational attainment; the benefits of music tuition having been shown in a previous study to have specific impacts on cognitive ability beyond those of drama (see Schellenberg, 2004).' The results of this evaluation have been reported separately (Haywood, Griggs, Lloyd, Morris, Kiss and Skipp, 2015).

The aims of this music-focused research evaluation of the overall programme were threefold: (i) to measure the impact of the music components (strings and vocal tuition) of the *Act Sing Play* programme on the musical development of the participating pupils; (ii) to measure the extent to which participation in any one of the three strands impacted upon pupil's perceptions of themselves in relation to wider aspects of their school experience; and (ii) to explore aspects of effective practice amongst the strings and vocal practitioners delivering the programme.

Act Sing Play was a programme of arts provision for pupils in Year 2 of their Primary careers (aged 6-7 years). The programme offered three strands of tuition: (i) strings; (ii) vocal; and (iii) drama. Creative Futures, an organisation specialising in the delivery of arts provision suited to a wide range of children's needs and contexts, delivered the programme over the course of the academic year September 2013 to July 2014. Initial consultation with members of the research team (from the UCL Institute of Education) and experts within the field fed into the initial development process of the curricula, with each strand being developed specifically for the project. Primary schools from four geographical areas in England participated in the project: Coventry, Essex, the London Borough of Hounslow and East Sussex. The participating schools represented a diverse range in terms of pupil population, location and levels of deprivation. In addition, none of the participating schools had instrumental provision as part of their Year 1 and 2 Primary curricula.

[iv] The Education Endowment Foundation (EEF) is an independent grant-making charity dedicated to breaking the link between family income and educational achievement, ensuring that children from all backgrounds can fulfil their potential and make the most of their talents. The charity aims to raise the attainment of children facing disadvantage by: (i) identifying promising educational innovations that address the needs of disadvantaged children in primary and secondary schools in England; (ii) evaluating these innovations to extend and secure the evidence on what works and can be made to work at scale; and (iii) encouraging schools, government, charities, and others to apply evidence and adopt innovations found to be effective. See https://educationendowmentfoundation.org.uk

Within a participating school, each class of pupils were randomly divided into three groups and each subgroup allocated one of the three arts strands. Subgroup size was in most cases ten pupils, although this varied in some contexts from 6 to 13 pupils to one practitioner. Each subgroup received one strand of the arts provision for the duration of an academic year. Weekly sessions (for a total immersion of 32 weeks) were timetabled so that each of the three strands of provision took place simultaneously. Each session lasted 45 minutes. For each class, one subgroup of pupils participated in stringed instrument lessons (choosing either violin or cello); the second subgroup participated in vocal lessons (based loosely upon the Kodaly method) whilst the final subgroup participated in drama lessons. Pupils in the string subgroup were taught the fundamental skills to play the violin or cello (including reading notation). Pupils in the vocal subgroup were encouraged to develop their voices in a variety of ways with a curriculum which used elements of the Kodaly method. The pupils in the drama subgroup were encouraged to develop their imaginations through story telling and movement.

The practitioners delivering the programme were freelance tutors sourced by Creative Futures and tutors employed by their local Music Education Hubs and contracted to deliver the project. In total, 32 practitioners were employed to deliver the programme (13 strings practitioners, 9 vocal practitioners and 10 drama practitioners). Some practitioners taught within more than one Primary school, and some practitioners taught more than one of the strands (i.e. strings and vocal sessions). Over the course of the year, only three tutors left and were replaced. All of the practitioners had previous teaching experience, although for some of the strings tutors, this may have been predominantly in small group or 1:1 teaching rather than whole class/large group teaching. Each tutor attended a three-hour introductory session, designed to make them familiar with both the aims and curricula of the programme. There was an expectation that, while the curricula would form the meta-structure of the programme (indicating learning goals and pedagogical approaches) individual practitioners would, in addition, use their professional knowledge and experience so as to be sensitive to the needs and demands of their pupils and their learning contexts. Each pupil in the string subgroup was allocated an instrument (either violin or cello) in an age appropriate size for the duration of the programme.

String practitioners worked with a curriculum that identified learning objectives for each term[v]. The key text was 'Fiddle Time Starters'[vi], with each participating pupil receiving their own

[v] For example, learning objectives for the first term included being able to demonstrate good playing posture and hold the instrument appropriately, use different bow lengths and bow speeds, recognise and play simple staff notation, understand some musical terminology and play using the first finger. By the end of the final term, learning objectives included the ability to use fingers 1,2, and 3 on each of the four strings, bow melodies with string crossing, play harmonics, read accidentals and perform particular exercise within the key text 'Fiddle Time Starters pieces'.

[vi] Blackwell, K. and Blackwell, D. (2012) Fiddle Time Starters: A beginner book for violin. Oxford: Oxford University Press and Blackwell, K. and Blackwell, D. (2012) Fiddle Time Starters: A beginner book for cello. Oxford: Oxford University Press.

copy. In addition, each string practitioner received a set of supplementary activities. String practitioners were encouraged to use their established pedagogy to respond to the needs of the pupils and meet the termly goals, although some specified activities were strongly advised so as to ensure a degree of continuity across the string provision.

Vocal Practitioners worked with a curriculum based loosely on the Kodaly method, in which pupils were encouraged to develop their musical skills through singing, listening and movement. Learning objectives[vii] and assessment criteria were suggested; for example, for the learning objective that the pupils should 'show and feel the beat', the assessment criterion was to 'experience and learn about the pulse in music and to speak rhythmically and show the beat in various ways'. Practitioners were provided with vocal and physical starter activities, warm-ups and a variety of learning opportunities. In addition, they were encouraged to use their professional knowledge in relation to their own pupils and reflect upon the extent to which objectives were achieved.

Drama practitioners were provided with a framework based around six stories, each lasting for between four and six weeks. The titles of the stories included 'The crashed spaceship', 'The orchid hunters', 'The snow queen', 'Women of the seas', 'Daedalus and Icarus' and 'The Giant's new coat'. The curriculum was designed to build pupil confidence, communication skills, focus, imagination and thinking skills. Suggested activities and approaches were given. Activities involved improvisation, tutor narration, discussion and physical games. As with the other subjects, drama practitioners were encouraged to be flexible in terms of their approach and response to their pupils.

Although the provision of a meta-structure curriculum for each of the subgroups would have established some common goals, activities and content across the *Act Sing Play* programme, the necessary respect for the craft knowledge of the individual practitioners and their own artistic responses to their pupils required a degree of flexibility (or deviation) that should be considered a cornerstone of effective teaching.

Within the design of the intervention, the drama strand acted as an active control, inasmuch as the subgroup of participating pupils were involved in an arts-based provision for the same period and duration of immersion as their music-based peers. As a result, pupils in the drama

[vii] For example, learning objectives in the first term included discovering and using the singing voice, explore vocal range and tuning, demonstrating musical memory, distinguishing pulse from rhythm and performing a rhythmic ostinato. Learning objectives for the final term included demonstrating an awareness of layers of sound (texture), differentiating between beat/pulse and rhythm, linking symbol to sound in rhythm work and demonstrating the ability to chant, sing and play in two parts with an increased vocal range.

strand participated in only one aspect of the research evaluation (i.e. to measure the extent to which participation in any one of the three strands impacted upon pupil's perceptions of themselves in relation to wider aspects of their school experience).

The research evaluation involved 890 pupils across 19 participating Primary schools in four different geographical regions across England (Coventry, Essex, East Sussex and Hounslow). Data was gathered from 302 pupils allocated to the strings subgroup, 303 pupils allocated to the vocal subgroup and 285 pupils allocated to the drama subgroup.

For the pupils in the vocal tuition subgroup, the measures used included an assessment of developmental singing competency and vocal behaviour. For the pupils in the strings tuition subgroup, measures used included a tutor assessment measure of musical behaviours and engagement. All pupils (across strings, vocal and drama subgroups) completed a 7-point Likert scale pupil questionnaire covering aspects of musical identity, learner identity and self and social inclusion.

2.3 Research aims

As previously stated, the aims of this research evaluation were threefold: (i) to measure the impact of the music components (strings and vocal tuition) of the *Act Sing Play* programme on the musical development of the participating pupils; (ii) to measure the extent to which participation in any one of the three strands impacted upon pupil's perceptions of themselves in relation to wider aspects of their school experience; and (ii) to explore aspects of effective practice amongst the strings and vocal practitioners delivering the project.

For the pupils in the vocal tuition subgroup measures used included an assessment of developmental singing competency and vocal behaviour. For the pupils in the strings tuition subgroup measures used included a tutor assessment measure of musical behaviours and engagement. All pupils (across strings, vocal and drama subgroups) completed a 7-point Likert scale pupil questionnaire covering aspects of musical identity, learner identity and self and social inclusion.

2.4 Research design

The research evaluation mirrored the trial design established by colleagues undertaking the NatCen research evaluation (Haywood, Griggs, Lloyd, Morris, Kiss and Skipp, 2015). Within a quasi-experimental design, each of the pupils were allocated to one of the three intervention groups[viii] (using a stratified randomisation that accounted for eligibility for Free School Meals,

[viii] All pupils in Year 2 took part in the *Act Sing Play* programme. However, in consultation with teaching staff some pupils (for example, those with severe emotional and behavioural difficulties) were excluded

age and sex) with pre-test and post-test. Details of the individual research tools and the data collection framework are detailed below.

2.5 Research timeline

Table 1: Research timeline and tasks

Intervention stage	Time point	Research task
Pre Intervention	March – August 2013	Research design Introductory sessions for practitioners (3 sessions)
First term	September – December 2013	Pre-test pupil questionnaires (all) Pre-test tutor assessments (strings) Pre-test vocal assessments (vocal) Mid-point tutor assessment (strings)
Final term	March – July 2014	Session observations Post-test pupil questionnaires (all) Post-test tutor assessments (strings) Post-test vocal assessments (vocal)
Post Intervention	August 2014 – June 2015	Data input and analysis Report preparation

2.6 Research tools: Assessment of vocal competency through song singing

Vocal competency was assessed using an established research tool (Welch et al., 2009, 2011, 2014) that gathered information on different aspects of vocal behaviour, with an aim to produce a composite picture (see Appendix E). Data gathered included: i) pupil's habitual speech pitch centre by asking each participant to count backwards from ten and noting the pitch; (ii) comfortable singing range by asking the pupil to imitate song fragments at various pitches; and (iii) vocal behaviour of two well known songs, which in all cases for this project were 'Twinkle, twinkle little star' and 'Happy Birthday'. Developmental vocal competency was assessed through the use of two established rating scales (Rutkowski, 1997; Welch, 1998) that, collectively, gave a holistic picture of current vocal behaviour. The assessment was completed in school, in a quiet space. The researcher worked with small groups of 4-5 pupils,

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from the randomisation and allocated to the subgroup that best suited their individual needs. Their inclusion in the pre-testing and post-testing was at the discretion of the teaching staff and the pupil's preference on the day of the researcher's visits.

with each pupil performing individually[ix]. A pre-test was gathered during the second half of the first term (October 2013-November 2013). All of the vocal subgroup pupils at school on the day of the visits were assessed. A post-test was gathered during the second half of the final term (June 2014-July 2014). Again, all of the vocal subgroup pupils at school on the day of the visits were assessed[x]. Pupils that were pre-tested earlier (October 2013) were post-tested earlier (June 2014) whilst pupils that were pre-tested later (November 2013) were post-tested later (July 2014) maintaining an 8-month window between pre- and post-test assessments. In total, 303 pupils completed one or more vocal assessments, with (n=240) matched pairs of singing assessments (both pre-test and post-test for the same pupil).

2.7 Research tools: Assessment of instrumental musical behaviours

The measure of instrumental musical progress during the *Act Sing Play* programme was the formal assessments undertaken by string practitioners[xi]. Each practitioner completed a specially designed pupil assessment survey at three different time points: (i) during the first six weeks of the programme (September to early October 2013); (ii) at the close of the first term (December 2013); and (iii) at the close of the summer term (July 2014). These surveys were designed to provide a comparative picture of the development of pupils' skills, knowledge and understanding in their instrumental playing as well as a sense of their engagement during the music lessons.

The first twelve statements were designed to measure various aspects of pupils' musical skills (see Appendix D). Practitioners indicated the level achieved on each individual skill using a 7-point scale ranging from 'Not evident' to 'Highly evident'. The responses to these 12 statements were averaged to create a composite score in order to represent a combined measure of students' musicianship in relation to their instrument. These composite scores were then compared across time points so as to determine if musical skills had changed over time.

The final 5 statements were designed to measure the level of engagement the pupil displayed

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[ix] During the research visit, the researcher listened to the pupil as they sang. Using the developmental criteria on each of the two scales, the researcher would judge the level of competency demonstrated and note this on the assessment form. Post-visit, data were entered into a structured query language (SQL) based database. The ratings given for the two songs, against the two independent scales, produced four measures that were converted into a single 'normalised singing score' (NSS) where a maximum score of 100 would indicate no obvious sung errors in the musical features of either of the two target songs.

[x] Some pupils were included in the post-test assessment of vocal competency that were not present for inclusion at pre-test stage. This occurred as a natural consequence of pupil transfer between schools and, in a small number of cases, as pupils had been moved between subgroups to best fit their individual needs. In later analysis, only paired assessments (pre-test and post-test pairing) were used.

[xi] String practitioners were supplied with paper copies of the research tool so that these could be completed either within session or shortly after. In discussion with string practitioners most completed the assessments after the programme sessions so as to enable them to reflect upon the individual pupil's progress and preserve the face-to-face contact time for the pupils.

with their instrumental learning. Practitioners indicated the level achieved on each individual skill using a 7-point scale ranging from 'Not evident' to 'Highly evident'. The responses to these 5 statements were averaged to create a composite score (ensuring that the polarity was reversed for negatively scored statements) in order to represent a combined measure of students' engagement in relation to their instrumental learning. These composite scores were then compared across time points so as to determine if engagement had changed over time.

In total, 302 pupils had one or more musical behaviour and engagement assessment completed, with (n=247) matched pairs (both pre-test and post-test for the same pupil).

2.8 Research tools: Pupil questionnaire

Previous research had established a questionnaire suited to use in predominately Primary school settings that detailed aspects of musical engagement as well as self and social inclusion in pupils (Welch et al., 2009, 2011, 2014). Research has suggested that there are 'genuine concerns about whether younger people have the cognitive, communicative and social skills necessary for providing good quality responses to survey questions' (Bell, 2007: 461) although there is an acceptance that survey instruments are suitable for use with children from around age seven providing that specially adapted questionnaires are used (Bell, 2007:462). As the previous research had involved a participant group from upper Primary pupils (Key Stage 2) a simplified and shorter tool was designed for use with the Year 2 pupils (Key stage 1 pupils aged between 6 and 7 years) from the participating schools. The questionnaire was completed in the pupil's classroom. The researcher introduced the task and the purpose of the research and explained that participation was voluntary. Pupils were seated according to their literacy groupings so as to better indicate those pupils who may require additional support with reading and comprehension. The class teacher was present in all cases and additional support staff also were often present. More able pupils proceeded independently, whilst the others listened as the statements were read aloud. A small number of pupils required 1:1 support with the adult acting as both reader and scribe so as to complete the task. In response to each of the 36 statements the pupils drew a circle around the 'smiley face' that best described their response (using a seven-point Likert-type smiley face scale as shown in Appendix C). Pictorial scales have been found to be more appropriate to younger children (Fallowfield, 1995). As previously stated, this type of visual analogue scale has been used successfully with other projects (cf. Welch et al., 2014) with children of a slightly higher age group (predominately from age 7).

Although randomly presented in the pupil handout, the statements were later grouped according to theme. These themes included: (i) Self and social inclusion, (ii) Musical contexts: School; (iii) Musical contexts: Home; (iv) Musical contexts: Informal settings; (v) Identity as a musician: Emotional engagement; (vi) Identity as a musician: Self; (vii) Health and happiness;

(viii) Identity as a learner: Literacy; (ix) Identity as a learner: Numeracy; and (x) Identity as a learner: Self. Some statements were presented with a negative polarity (for example, ‘writing is hard’). The statements grouped by theme are given below:

Self and social inclusion
- I like going to school
- I have many friends
- I feel left out of things at school (negative)
- I feel good about myself

Musical contexts: School
- I sing at school
- I like the music that I play at school
- Music at school is fun
- I play a musical instrument at school

Musical contexts: Home
- I play my musical instrument at home
- Members of my family tell me I am good at music
- I like listening to music
- I have lesson on a musical instrument at home

Musical contexts: Informal settings
- My friends teach me songs
- I like playing my musical instrument with my friends
- I like singing with my friends

Identity as a musician: Emotional engagement
- I like making music
- Playing a musical instrument is fun
- Playing a musical instrument makes me feel happy
- Singing is fun

Identity as a musician: Self
- I am the best musician in my class
- Playing an instrument is a talent (negative)
- Playing an instrument is something that everyone can do
- Playing a musical instrument is easy
- Practice will make me a better musician

Health and happiness
- I am a friendly person
- I am very happy
- My body is healthy

Identity as a learner: Literacy
- I find reading easy
- I like to write down my ideas
- Writing is hard (negative)
- I like reading

Identity as a learner: Numeracy
- I like working with numbers

- Working with numbers is easy

Identity as a learner: Self

- I know the answers to the questions my teacher asks
- If something is difficult I am more likely to give up (negative)
- I can explain my ideas when I talk to other people

2.9 Session Observations

Previous research had established a simple observation schedule for both pupils and practitioners that enabled the observed behaviours to be recorded in real time for later analysis (Saunders et al., 2010, 2011, 2012a, 2012b; Saunders and Le Messurier, 2014). The researcher sat in the session as an observing non-participant and notes the behaviours of the participants. For each minute of the observed session, multiple behaviours could be recorded so as to reflect the complexity of the learning context. Details of behaviours adhering to seven key areas were noted, including: (i) planning and setting objectives; (ii) effective teaching methods; (iii) questioning techniques; (iv) provision of feedback; (v) plenaries; (vi) musical behaviours; and (vii) classroom organisation. Additional aspects were added to the schedule according to the specific needs of the observed session. The same level of detail was recorded for the pupil body, thereby creating a framework of teaching and learning interactions. Examples of both the practitioner and pupil framework can be found as Appendix A and B respectively.

Visits were made to two schools within three of the geographical regions and one school from one geographical region during the summer term of 2014 to complete session observations. In each of the 7 schools visited, 2 observations were completed of the strings and vocal sessions. As the intervention sessions were designed to run simultaneously, the research schedule was designed to include some of the larger Primary schools with two or more classes so as to ensure that the two different interventions could be observed during the same field trip. In total, 14 observations were made.

3. Findings

3.1 Assessment of vocal competency through song singing

A comparison of the two datasets for the pre-test and post-test revealed a significant improvement in children's song singing across the eight months. The children's song singing was assessed using two standard rating scales. The ratings were then combined for each child and normalized to produce an overall individual score, or Normalized Singing Score (NSS). A paired-samples t-test (n=240) was conducted to compare the NSS scores for pre-test and post-test. There was a statistically significant increase in the NSS scores from pre-test (M=46.31, SD=13.12), to post-test (M=59.75, SD=12.23), $t(239)=-16.78$, $p<.001$ (two-tailed).

In more detail, the mean NSS score for pupils at pre-test was relatively low (less than half the highest possible score) and corresponded with descriptors from the ratings scales[xii] including voice 'waivers between speaking and singing voices and uses a limited range when singing' and 'there is a growing awareness that vocal pitch can be a conscious process and that changes in pitch are controllable. Sung melodic outline begins to follow the macro contours of the target melody'. With mean ratings at post-test approaching two-thirds of the highest possible score, descriptors from the rating scales described behaviours including 'consistent use of initial singing range (usually d4 to f4)' and 'melodic shape and intervals are mostly accurate, but some changes in tonality may occur, perhaps due to inappropriate register usage. Overall, however, the number of different reference pitches is much reduced'.

Previous research (Welch et al., 2010) assessed Primary pupils from across England as part of the National Singing Programme '*Sing Up'*. For comparison, the pre- and post-test NSS scores for the *Act Sing Play* vocal subgroup are shown against age equivalent data for '*Sing Up*' (see Figure 1, below). This illustrates two key points: (i) the low initial NSS score evidenced in the *Act Sing Play* vocal group, indicating that vocal development was much less advanced amongst the participant pupils; and (ii) the extent of their subsequent progress which begins to bring the *Act Sing Play* in line with age appropriate expectations.

[xii] See Appendix E for full text of the rating scales used in the assessment of vocal competency.

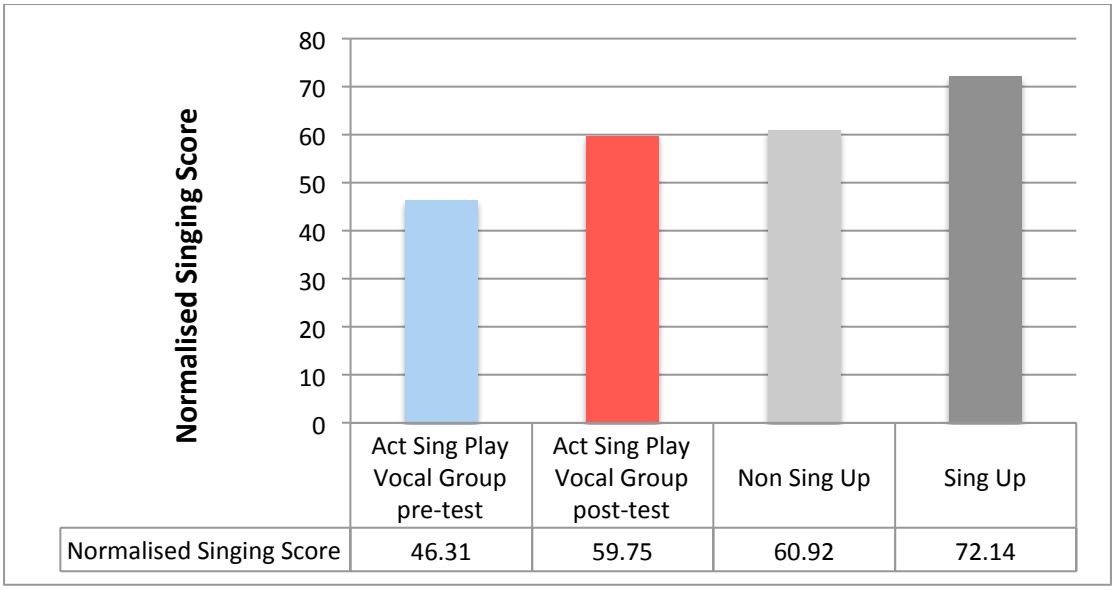


Figure 1: Mean Normalised Singing Score (NSS) for Act Sing Play vocal subgroup pupils (n=240) in October 2013 (pre-test) and July 2014 (post-test) set alongside mean normalised singing score for pupils of the same ages in the National Singing Programme 'Sing Up' dataset (n=972).

Although all pupils in the vocal subgroup made statistically significant improvements in song singing competency, the gains were significantly higher for female pupils than male pupils, (see Figure 2, below). A one-way analysis of variance was conducted to explore the impact of sex (male, female) on mean NSS. There was a statistically significant difference in NSS scores for female pupils, $F(1)=9.47$, $p=.002$. This corresponds to commonly reported sex differences in singing competency (Welch et al., 2009, 2011).

A one-way between groups analysis of variance was conducted to explore the impact of region (Coventry, Essex, East Sussex and Hounslow) on the mean normalised singing score. There were no significant differences found, indicating that pupils are achieving irrespective of geographical region (see Figure 2, below).

In summary, the mean of normalised singing scores (NSS) at pre-test would suggest that vocal development was at an early stage for many of the pupils involved in the project. Following matched pair comparisons of pre-test and post-test assessments of the pupils who took part in the Vocal subgroup (n=240) of the *Act Sing Play* programme, statistically significant improvement was evidence in post-test measures. As has been commonly reported, there were sex differences in the normalised singing score, with female pupils (n=125) scoring higher than males (n=115).

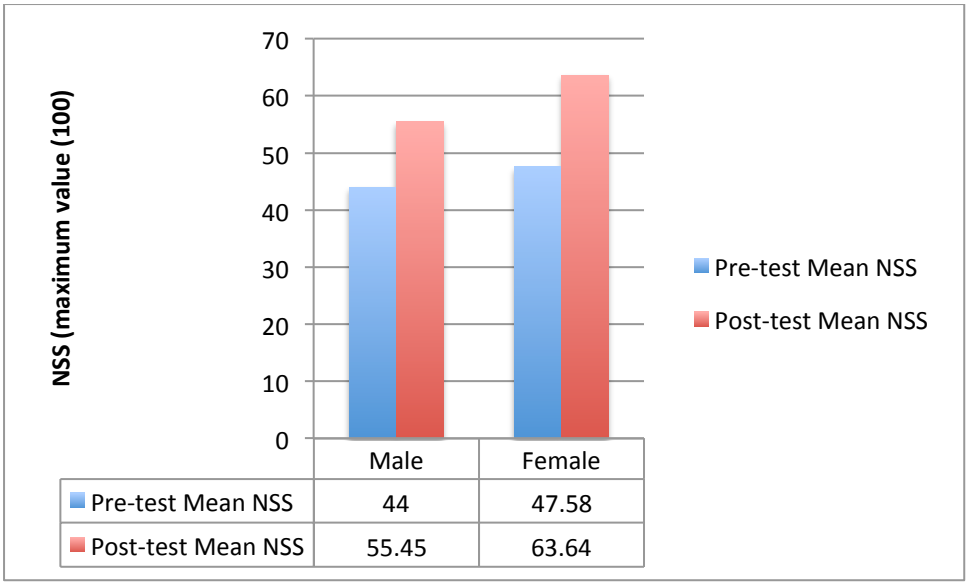


Figure 2: Comparison of pre-test and post-test means of Normalised Singing Score (NSS) for assessment of vocal competency in the *Act Sing Play* vocal subgroup (n=240) shown by sex, male (n=115) and female (n=125).

3.2 Assessment of instrumental (string-based) musical behaviours

Practitioners indicated the level achieved on each individual skill using a 7-point scale ranging from 'Not evident' to 'Highly evident' for twelve statements designed to measure various aspects of pupils' musical skills. The responses to these 12 statements were averaged to create a composite score in order to represent a combined measure of students' musicianship in relation to their instrument. These composite scores were then compared across time points so as to determine if musical skills had changed over time (see Figure 3, below).

A paired samples t-test was conducted to evaluate the changes in composite scores for the practitioner assessment of musical behaviours over the duration of the programme. There was a statistically significant increase in mean scores from pre-test (M=3.79, SD=1.37) to post-test (M=5.29, SD=1.22), t (247)=-15.65, p<.001 (two-tailed) for n=247 pupils for whom matched pair data were available. This would indicate that the string practitioners were positive about the improvement made by pupils over the duration of the academic year and pupils demonstrated a measurably significant increase across musical behaviours in their instrumental competency.

In addition to the pre- and post-test measures, a mid-point measure was taken for the string subgroup. Falling after the first term of immersion in the *Act Sing Play* programme, the mid-point measure could act as an indication as to how quickly pupils began to achieve instrumental competency. A paired samples t-test was conducted to evaluate the changes in

composite scores for the practitioner assessment of musical behaviours. There was a statistically significant increase in mean scores from pre-test (M=3.73, SD=1.43) to mid-point (M=4.47, SD=1.22), t (240)=-11.03, p<.001 (two-tailed)[xiii]. This would indicate that the string practitioners were able to report a smaller but positive improvement in the mean scores made by pupils over the first term of the programme.

A paired samples t-test was conducted to evaluate the changes in composite scores for the practitioner assessment between the mid-point and post-test of musical behaviours. There was a statistically significant increase in mean scores from mid-point (M=4.49, SD=1.24) to post-test (M=5.42, SD=1.14), t (224)=-13.03, p<.001 (two-tailed).

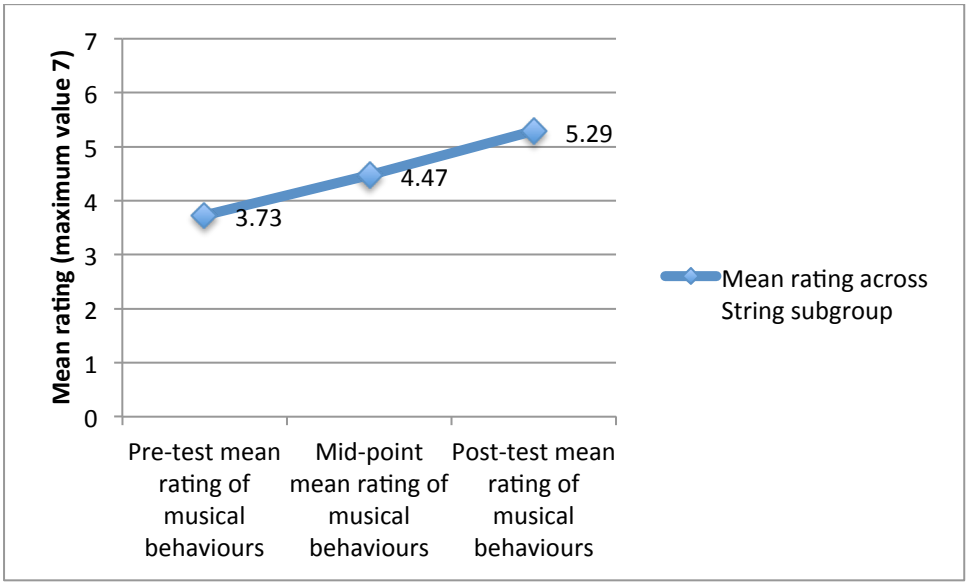


Figure 3: Comparison of pre-test, mid-point and post-test means of practitioner assessment of musical behaviours in the *Act Sing Play* inms subgroup (n=247).

Finally, an independent sample t-test was conducted to compare the progress in musical behaviours between male and female pupils. With very similar mean values, there was found to be no significant differences between male (M=1.49, SD=1.53) and female (M=1.50, SD=1.48) pupils. This would indicate that gender is not a factor in pupils' instrumental learning. This finding correlates with recent research in Primary settings following an El Sistema influenced programme (Welch, Saunders, Le Messurier, Sarazin and Himonides, 2014).

The final five statements on the practitioner's assessment of musical behaviours referred to the level of engagement that the pupil displayed in their instrumental learning. Responding to

[xiii] Paired samples t-tests require that only matched pairs of data are included. Therefore, for sample size analysed varies slightly. In pre-test to mid-point n=241 matched assessments, in mid-point to post-test n=225 matched assessments and from pre-test to post-test n=247 matched assessments.

a 7 point Likert scale, with some reverse polarity items (i.e. disengaged), the mean scores were calculated for pre-test, mid-point and post-test. A paired samples t-test between the pre-test and post-test of measure of engagement indicated a statistically significant increase in mean scores from pre-test (M=4.9, SD=0.88) to post-test (M=5.05, SD=0.88), t (270)=-2.70, p<.007 (two-tailed). No other significant measures were found. This would seem to indicate that a positive trend in engagement over the duration of the yearlong programme.

In summary, the analysis of the instrumental practitioners' assessments of musical behaviours indicates that pupils made significant progress throughout the duration of the Act Sing Play programme. The improvement made during the first term was statistically significant and the extended duration of the full academic year enabled pupils to consolidate and further extend their progress (again, achieving statistical significance). This would suggest that longer immersion periods (such as this year long programme) might contribute to greater instrumental competency. There were no differences found in the pre-test and post-test gains according to sex.

3.3 Pupil questionnaire

As mentioned earlier, there were ten themes represented across the 36-item pupil questionnaire. Overall, there are relatively minor changes in mean responses from pre-test to post-test, even though several themes had lower means in the post-test.

Subsets of matched pairs of measurements for the same pupils for each theme revealed non-significant differences for four themes: 'self and social inclusion', 'health and happiness', 'identity as learner: literacy' and 'identity as learner: numeracy'. Five themes had statistically significant negative changes: 'musical contexts: school', 'musical context: home', 'musical contexts: informal', 'identity as musician: emotional engagement' and 'identity as musician: self'. One theme had statistically significant positive changes: 'identity as a learner: self'. However, in each instance all the means for both the pre-test and post-test themes were positive, being between four and six on a seven- point scale (see Figure 4, below).

The pupil questionnaire results indicate that initial mean scores were high. Given the high means initially reported there are several possible explanations for this outcome, any or all of which may interact: i) the pupils may have experienced fatigue in completing the post-test questionnaire (identical to the pre-test) within the same academic year; ii) the post-test questionnaire was administered late in the summer term for all participating schools, at which stage it would be expected that pupils were physically and mentally tired; iii) following relatively high reported means at pre-test, high means at post-test could simply indicate an expected and acceptable fluctuation.

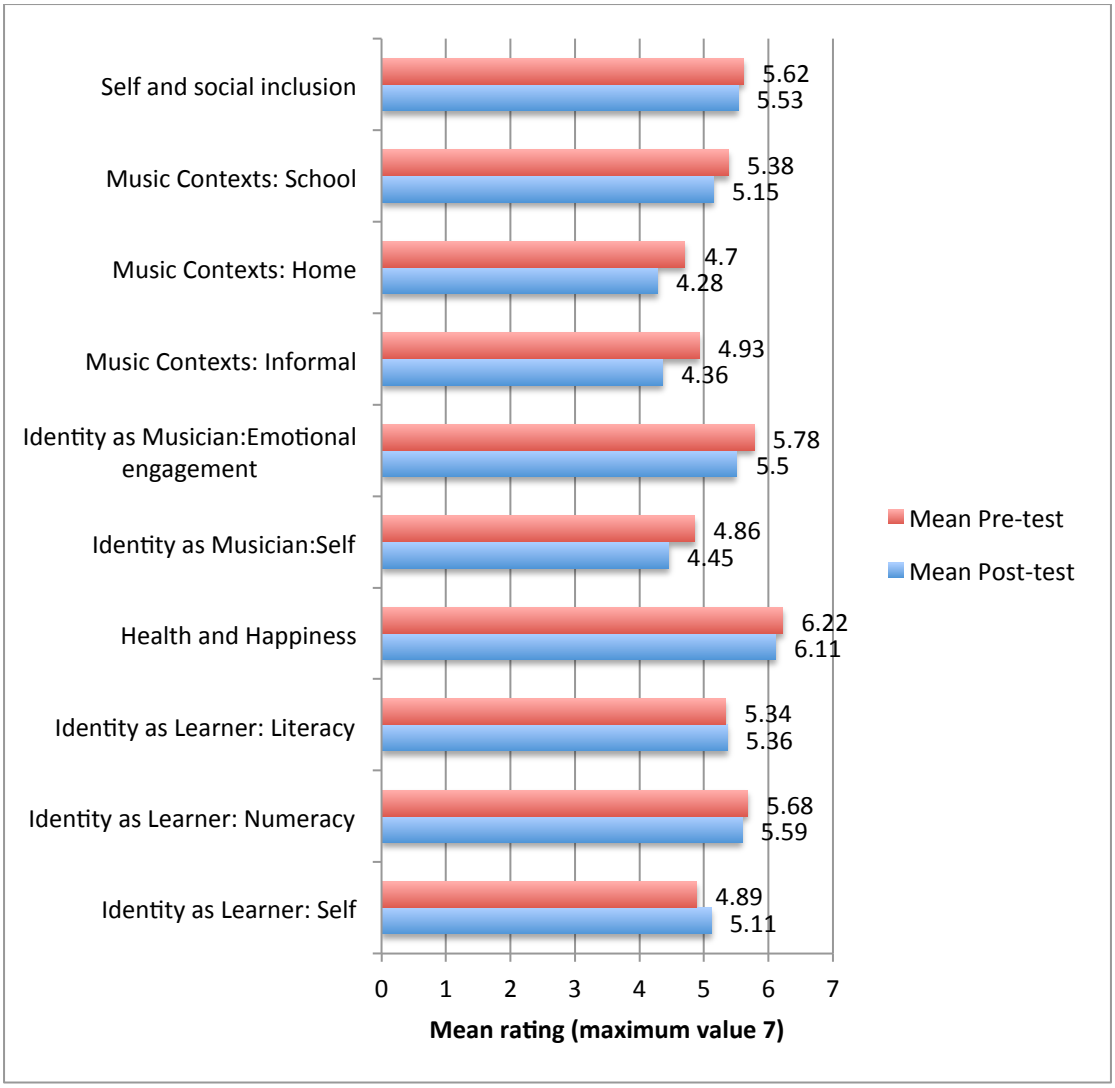


Figure 4: Matched pair comparison of pre-test and post-test means of themes in the pupil questionnaire as completed by all pupils in the *Act Sing Play* string subgroup (n=590).

In summary, the analysis of the pupil questionnaires suggested that the Year 2 pupils were positive about all of the aspects of their school and musical lives itemised as key themes. The responses indicated that this positivity was maintained throughout the year with broadly similar mean ratings given at post-test.

3.4 Session observations

Visits were made to two schools within three of the geographical regions and one school from one geographical region during the summer term of 2014 in order to complete session observations. In each of the seven schools visited, two observations were completed of strings and vocal sessions. As the intervention sessions were designed to run simultaneously, the research schedule was designed to include some of the larger Primary schools with two or more classes so as to ensure that the two different interventions could be observed during the same field trip. In total, 14 observations were made. From the observations made, five sessions are presented in more detail so as to illustrate the processes through which learning

interactions take place. Finally, an overview of effective practice is given to draw common themes and differences from across the group.

3.4.1 Observation of string session (a)

The practitioner welcomed the twelve pupils into the classroom and asked after their general well being. The social interaction was combined with the pupils unpacking their instruments (nine violinists and three cellists) and the practitioner tuning these, as required. This session was typical of the programme in that it included pupils learning both violin and cello together, designed to enable a richer and more rewarding ensemble sound. The session focussed on a forthcoming 'end of project' performance to parents. The practitioner established high expectations in relation to the tasks that needed to be accomplished (getting instruments out, finding music, placing music on stands and standing ready for action). The pace of the session was elevated and there was a buzz of activity. The aim of the lesson was introduced and the group watched and repeated simple warm up activities that the practitioner modelled. A stream of closed questions accompanied each of the short activities that encouraged the pupils to consider specific elements of their learning (for example 'Where are your beautiful bow holds' and 'What string do we start on?'). All of the pupils played as an ensemble creating a richer sound. The session was momentarily interrupted to allow for the particular needs of one pupil, who—after a short time—was re-introduced into the group. The practitioner modelled all of the playing and singing activities and, by so doing, scaffolded the needs of individual pupils as required through the use of body language, eye contact and positioning themselves in closer proximity to any pupil who needed further support. The analysis of session (see Figure 5, below) revealed a very high level of active pupil participation that indicated the level of positive engagement in the learning experience. Each of the activities was approached in a musically satisfying manner; for example, pairs of pupils performed scales, with one starting after the other so that the scale was heard in thirds. Pupils played with their eyes closed focusing on their muscle memory and listening skills to assess the accuracy of their finger positions. The practitioner asked pupils to vocalise each task that they would later play, and the pitching accuracy of the group was high. The practitioner taught a fast paced session that immediately established and maintained a musical way of working, with high levels of musical vocabulary and a real expertise in breaking tasks into short and achievable steps that enabled all of the pupils to engage and achieve. This approach created a lesson that enabled pupils to hear their own achievements and experience the positive feedback of a successful performance.

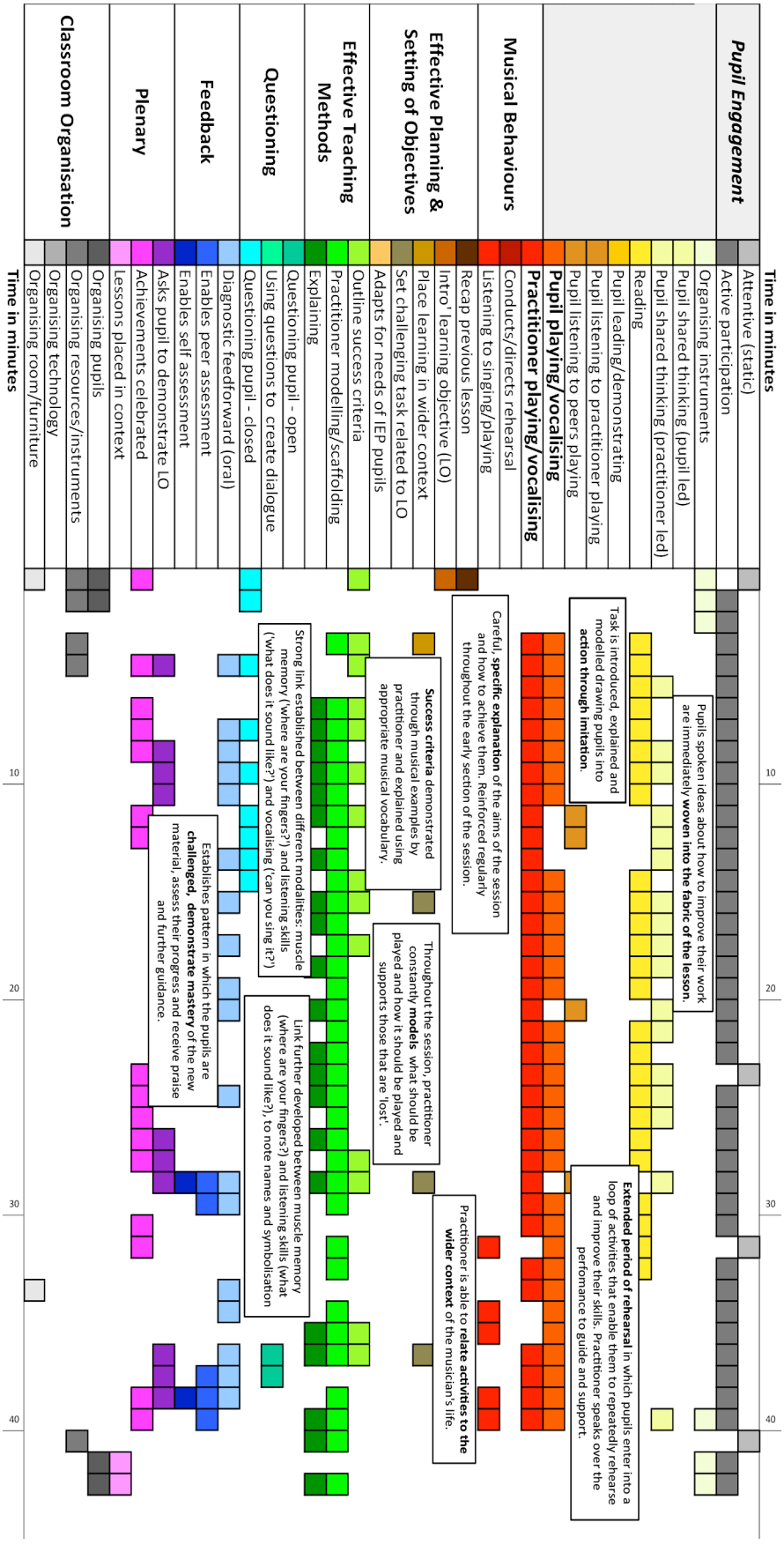


Figure 5: Learner teacher interactions for observed string session (a)

3.4.2 Observation of string session (b)

The practitioner welcomed the pupils into the large teaching space and immediately the pupils prepared themselves to play. This was an ensemble opportunity, with string groups from two classes brought together to rehearse for an end of project performance. The richness of the sound brought the class teachers back from their own classroom tasks to listen to their pupils. The practitioner was meticulous in their presentation of musical material. They played and simultaneously sang (or chanted) the note names at the appropriate pitch and moved to the pulse of the music. Gestures were bold and dynamic. These were repeated frequently, underlining good technique at all times. Strong links were immediately established through a series of closed questions – these were sometimes part of a one-sided dialogue to model an invisible thought process. 'Where is my first finger?' 'Does that sound quite right?' 'What should I do?' 'What should it sound like?' 'Can I sing the note I need?' Later, as the pupils warmed to the learning context, they chanted along as they problem-solved for themselves. They were applying a scaffolding technique and, in turn, helping their peers around them. As the lesson progressed, the practitioner deepened the learning to include the note names and relevant musical vocabulary, symbolisation and foreign terminology, but returned to the beginning of the process to consolidate learning for those that need additional support. The level of active engagement and playing by both pupils and practitioner was high (see Figure 6, below). As an ensemble, they entered into a period of extended rehearsal where short activities were looped so as to rehearse and embed musical memory. The practitioner played and sang throughout, 'I play, you play', setting instrument groups in flow so that the musical output was enriched by sections working in harmony.

Bows began to rise and fall together and pupils noted to one another when their actions were 'out of time'. There was pride when the movements were synchronised. Links were made to other orchestras and the need to work as part of a team. Praise was peppered throughout the session, tightly linking progress, feed forward (formative assessment that enables the learner to immediately act upon it) and the consolidation of skills. Time was made for simple activities to be done well and, through this process, instil a sense of achievement in the pupils. Short breaks were taken to rest tired arms and enable pupils to feed into the process. 'What do we need to improve?' 'What can we do to make it sound better?' The pupil's ideas were woven into the next activity, communicating that their opinions were explicitly valued. This was a gently paced session with a high degree of instrumental playing. The pupils worked through a set of carefully planned activities that enabled them to experience a sense of achievement, a rich and satisfying ensemble sound and to consolidate their own skills. This was achieved through constant modelling of good technique and a musical dialogue that scaffolded the pupil's ability to increasingly support their own learning and performance.

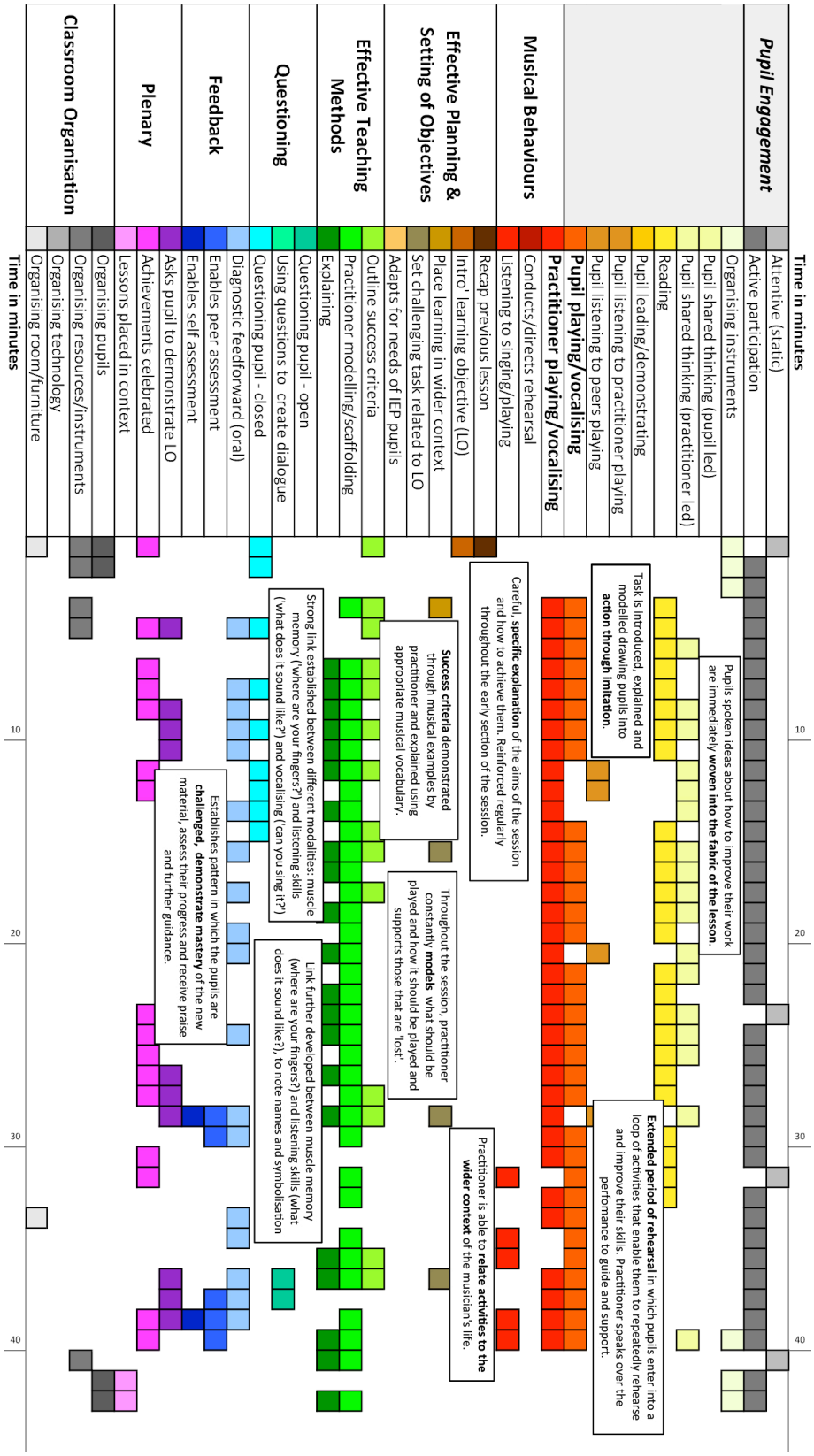


Figure 6: Learner teacher interactions for observed string session (b)

3.4.3 Observation of string session (c)

As something of a contrast to the other two string observations illustrated above, this example shows how the same fundamental techniques could be adapted so as to suit the particular learning needs of the pupils and the learning context (see Figure 7, below). The teaching space for this session was the main hall, used at lunchtimes for dinner (evidenced by the cleaning staff sweeping the floor at the beginning of the session) and also used by pupils and staff as a corridor throughout the entirety of the lesson. A constant flow of pupils travelled through the teaching space, some pausing to watch and listen, others continuing their conversations oblivious to the learning that might be disturbed. Lack of space is an issue in many Primary school contexts, and all the practitioners observed demonstrated resilience in their creative responses to the issues that arose. Working to counteract the disturbances, the practitioner broke the session down into discrete units that facilitated frequent re-engagement tasks. They used talk to explore particular aspects of learning and closed questioning to explicitly address named pupils to assess recall and understanding. The sparse patterning of activities (in comparison with the other string examples illustrated) reflected the way in which the practitioner planned each activity within a short timeframe, bringing it to a close and refocusing the pupil's attention. This served to maintain a reasonable level of engagement with a group that was easily distracted in a setting that was frequently infringed upon. The practitioner explained the task verbally, checking that pupils had understood before modelling with the violin. Pupils watched and responded to their questioning and some shared thinking developed. Pupils played their instruments whilst the practitioner walked around assessing their playing technique and posture. By choosing to separate the tasks, the practitioner was able to closely monitor the pupils and ensure that engagement was maintained. The pupils in this group worked from additional activities as supplied by the practitioner as well as reading the notation so as to work on the activities from the key text. The pace of the session ebbed and flowed according to the task. There was a good sense of internal coherence between the lessons activities and this fed positively into the overall structure. In order for learning to be maintained over the short activities, the practitioner needed to have planned this approach carefully. This was managed with some delicacy by the practitioner so as to help maintain engagement. In later discussion, the practitioner described how they had to adapt their approach to the group according to the 'feel' of the session and the individual reactions of the pupils in the group to a greater extent than other groups that they taught. The willingness and ability to react and adapt to the changing needs of the pupils and their learning was a real strength of the practitioner's teaching practice.

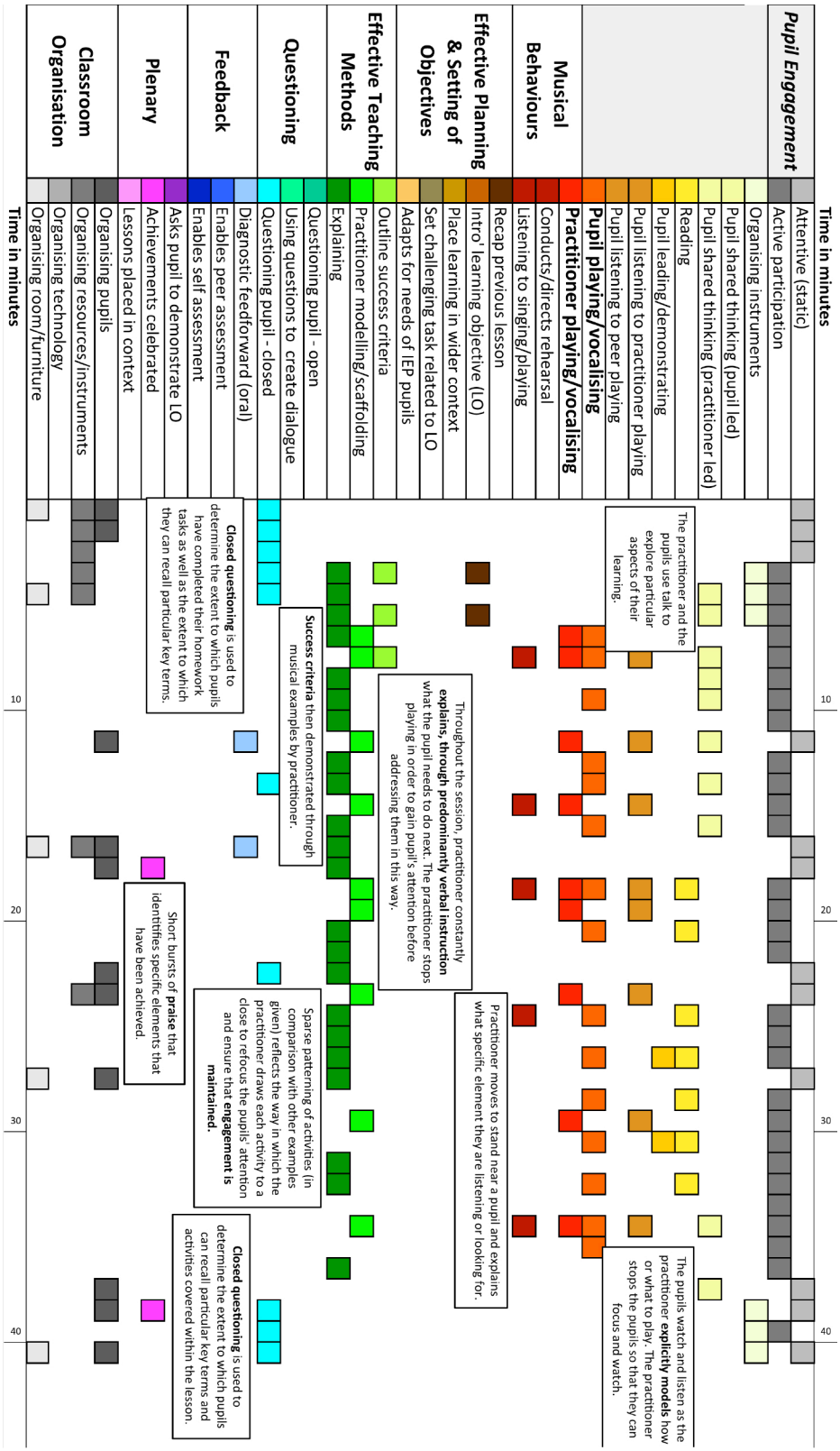


Figure 7: Learner teacher interactions for observed string session (c)

3.4.4 Observation of vocal session (d)

The vocal practitioner for this session met their group from the classroom and brought them to the teaching space. As they entered the teaching space, they began to sing a song following the lead of the practitioner. This immediately set the tone for the session, as the pupils had already moved into a musical way of working. They demonstrated this through walking and swaying in time to the pulse of the song and immediately sat down when the verse came to an end. The practitioner made explicit links between those aspects of the song that the pupils had performed well and those that needed further development by modelling and explaining the purposes behind a series of short activities. These focused on physical and vocal warm ups that were followed by another performance of the opening song and, through a series of closed questions pupils were invited to suggest how they thought the second performance had felt and sounded as a result. The practitioner was skilled in being able to relate each activity chosen to a larger overall aim that could also be explained to the pupils. This served not only to link the activities together (thereby creating a sense of internal coherence within the session), but also facilitated the process through which the pupils could learn, feel and hear how particular exercises affected the voice and the breath. Where closed questioning led to shared thinking, the pupils were asked to demonstrate their ideas musically rather than through vocabulary. Whilst establishing a link between the musical vocabulary and the musical output, this also enabled some pupils to respond with physical and dancelike gestures to express rhythmic patterns and melodic contour. The high level of necessary verbal explanation that accompanied the beginning of the lesson (talking about the music) developed into musical behaviours as the practitioner increasingly used gesture and their own singing voice to outline success criteria. The pupils were asked to demonstrate specific musical behaviours and did so with confidence and some accuracy. Pupils used their voices to good effect and were keen to volunteer to demonstrate, lead and perform solos. There was a tight cycle of formative assessment, peer assessment, self-assessment and practitioner praise. The practitioner facilitated a process through which pupils learned to identify quality and progress in their work. High levels of practical engagement were noted and the pace of the session remained high throughout the session (see Figure 8, below). The practitioner used the keyboard to create a more complete performance for the pupils, but only after any issues with the song had been addressed. Whilst playing the keyboard, the practitioner managed to combine singing, nodding their head to indicate the pulse as well as using facial expressions, including raised eyebrows, to indicate particular entries of the song. As the pupils left the teaching space, they continued to sing.

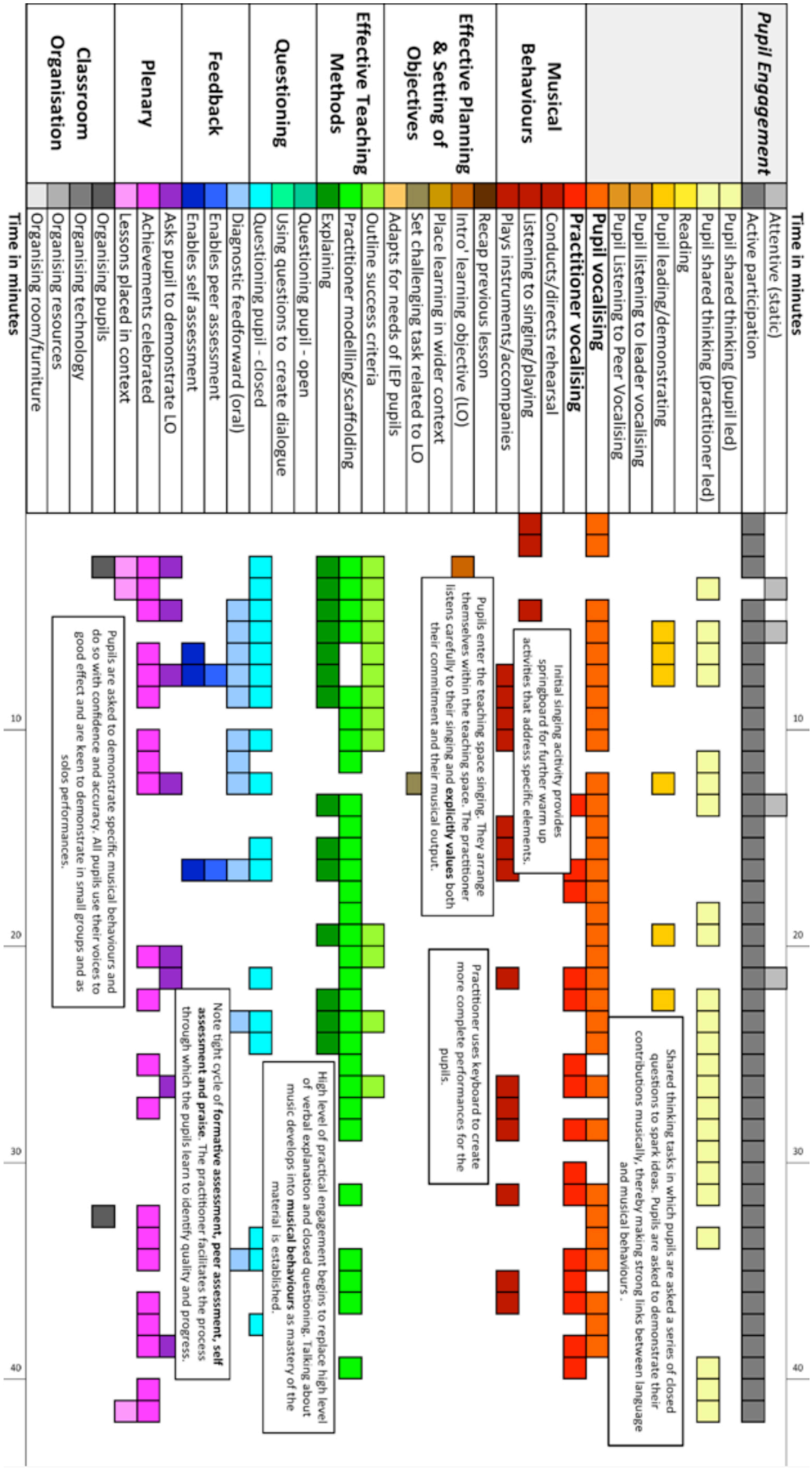


Figure 8: Learner teacher interactions for observed string session (d)

3.4.5 Observation of vocal session (e)

The vocal practitioner who led this session was skilled at interweaving activities over both a short and longer timeframe in order to best support learning and engagement. Pupils were immersed into a musical setting from the outset and the practitioner modelled careful and attentive listening, explicitly valuing both the commitment and musical output of the pupils. Following an initial physical and vocal warm up, the practitioner made explicit links between these and extension activities that addressed specific elements of technique including breathing and posture. The practitioner made the success criteria for each task clear through constant modelling of good technique. Throughout the session (and in contrast to some of the observation illustrated above) the level of verbal explanation remained relatively low. As the session progressed, the amount of verbal explanation reduced still further and communication was often made through turn taking of musical utterances supported by gestures. As in observation (d) above, the pupils used their voices to good effect and were keen to volunteer to demonstrate, lead and perform solos. There was a tight cycle of formative assessment, peer assessment and practitioner praise. The praise was specific to the individual pupil and careful to consider effort as well as achievement. The practitioner facilitated a process through which pupils learned to identify quality and progress in their work. High levels of practical engagement were noted and the pace of the session remained high throughout the session (see Figure 9, below). The pace of the session built through a series of shorter activities that worked thematically towards a longer activity. Both the shape and pace of the session took their strength from the internal coherence of the activities and the obvious degree of planning that underpinned them.

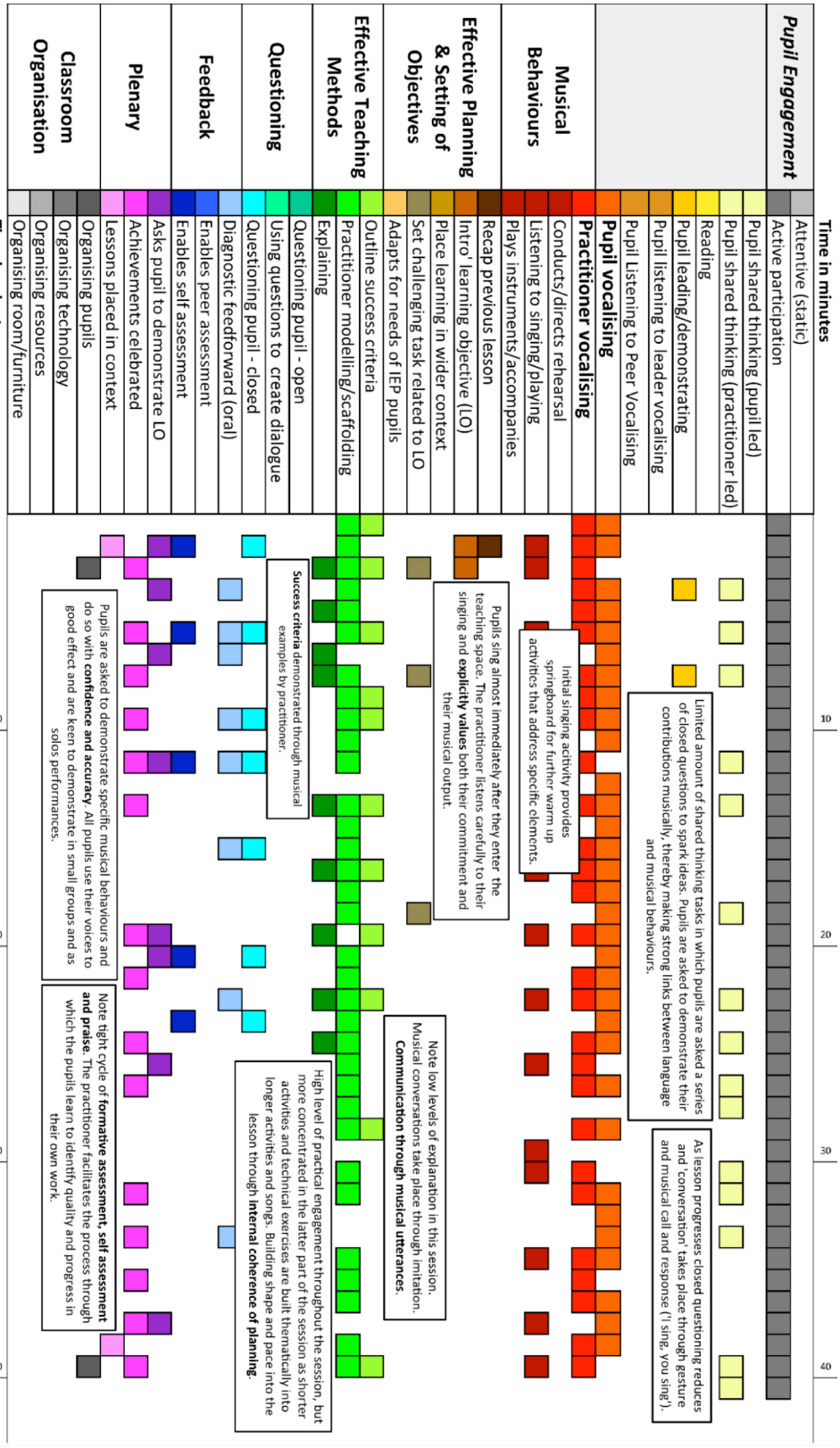


Figure 9: Learner teacher interactions for observed string session (e)

3.4.6 Summary of session observations

Working across the observations of effective teaching in the string and vocal sessions of the Act Sing Play programme, there are a number of key elements that are worthy of note. Effective practice in these settings can be identified by the bodily involvement of practitioners. Expressive hand gestures and dance-like embodiments of rhythms form an implicit part of the musical model that they portray. This finding correlates with previous research in effective vocal and instrumental teaching (Saunders and Welch, 2012; Saunders and Le Messurier, 2014) and is an area of practice worthy of further investigation.

Effective practice can also be identified by the use of the singing voice to deliver explanation, technical information and links from sound or technique to key word vocabulary. This was evidenced frequently in both strings and vocal practitioners. Previous research has identified a predominance of 'teacher talk' as indicative of less effective teaching (Saunders et al., 2012). However the observed practice of delivering information set to simple melodies (often based on the curriculum content), or a recitative style delivery (multiple syllables set to a constant pitch) translated conventional 'teacher talk' into more musical interactions. This was also used to good effect in the structural organisation of the lesson, including re-engaging pupils, moving pupils around the teaching space and completing registers. Musical interactions as a means of organising the classroom have previously been identified as an indicator of effective Primary teaching in literacy and numeracy lessons (Saunders, Himonides and Welch, 2010). With pupils of the age group in this project (Year 2), the extensive use of song to transmit information is both pedagogically familiar (Saunders and Le Messurier, 2014) and echoes the early communication patterns in the home context with caregivers.

Across the observed sessions, learning took place beyond that of the specific musical skills expected of a programme such as *Act Sing Play*. Physical skills and co-ordination were practised, not only with instrument specific posture and fine motor movement of the fingers, but dancing and moving in time and responding physically to rhythm and metre. In some of the observed sessions, wider aspects of learning were introduced, with links to numeracy and literacy as well as historical and current cultural events. In addition, aspects of social and emotional learning were evidenced (see Figure 10, below). The distribution of these types of learning differed widely (with the musical learning taking a key role in all lessons), but there was likely to be interplay between these four main elements, often including one or perhaps two elements in addition to the teaching of specific music skills. This patterning has been evidence in previous research (Saunders and Le Messurier, 2014) and is reproduced below to illustrate the potential overlap that *Act Sing Play* sessions afford skilled practitioners (see Figure 11, below).

From the observations made, there would appear to be four main 'elements' within a session, defined primarily by the age of the pupils and the scheme of work followed.

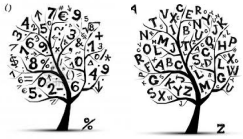
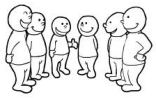
Specific Musical skills...	Physical skills & co-ordination...	Wider aspects of curriculum learning...	Wider aspects of social and emotional learning...
			
For example... ✓ Rhythm ✓ Discovering the voice ✓ Pitch ✓ Notation ✓ Playing with instruments ✓ Composition	*For example...* ✓ Clapping and pulse ✓ Coordination ✓ Movement ✓ Breath control ✓ Spatial skills	*For example...* ✓ Numeracy ✓ Literacy (including oral language) ✓ *History* ✓ *Geography*	*For example...* ✓ Empathy and understanding ✓Confidence ✓Listening ✓ Effective communication in the classroom context

Figure 10: Types of learning observed within effective music learning contexts (from Saunders and Le Messurier, 2014).

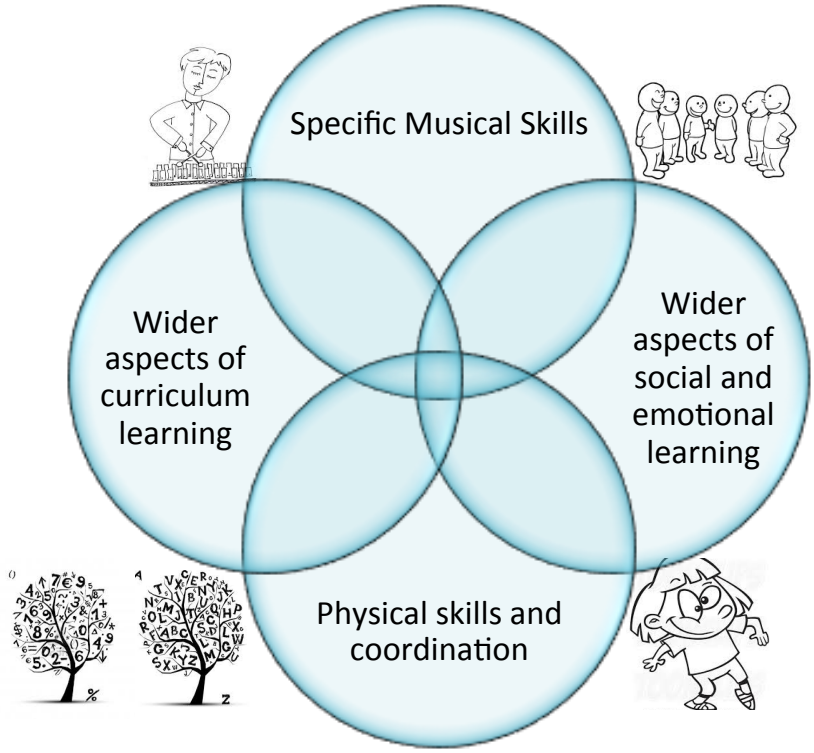


Figure 11: Interaction between four main types of learning within sessions (from Saunders and Le Messurier, 2014).

4. Concluding remarks

The key findings were as follows:

There is empirical evidence that, overall, there were significant improvements in the pupil's musical behaviours and development of the yearlong intervention of *Act Sing Play* programme. In more detail:

• The mean singing assessment scores at pre-intervention would suggest that **vocal development was at an early phase for many of the Year 2 pupils involved in the project**. Following matched pair comparisons of pre-intervention and post-intervention assessments of the pupils who took part in the vocal subgroup (n=240) of the *Act Sing Play* programme, **statistically significant improvement was evidenced of song singing in post**-intervention **measures**. As has been commonly reported elsewhere in the research literature, there were sex differences in the singing assessments, with female pupils (n=125) scoring higher than males (n=115). Although there was sex differences evidenced (in line with national and historical data) of girls being more developed than boys, for the pupils in the vocal subgroup, an improvement in children's singing competency was evidenced for both male and female pupils.

• The instrumental tutors' assessment of musical behaviours show that **pupils made significant progress on their instruments throughout the duration of the Act Sing Play programme**, with significant learning gains in the first term that were **extended across the full academic year** (again, achieving statistical significance). This would suggest that longer immersion periods (such as this year long programme) are likely to contribute to greater instrumental competency, as reported elsewhere. For the pupils in the String subgroup, the instrumental practitioners mean ratings of children's instrumental knowledge, skills and understanding had improved significantly. The musical behaviours included pupil's understanding of the music being played, their ability to recognise and discriminate between musical elements (such as pitch, rhythm and dynamics), their ability to recognise when melodic or rhythmic patterns were repeated, their adoption of an appropriate posture for playing their instrument, their ability to produce musical sounds in terms of tone quality and intonation, demonstrating recognisable improvements in their instrument-specific physical coordination, their abilities to listen to music with concentration, link heard sounds to written symbols (notation), to listen, watch and respond appropriately to the playing of others, their ability to repeat melodic and rhythmic phrases on the instrument by memory, and to sing back heard melodic phrases.

• The analyses of the pupils' attitudinal and self-identity questionnaires suggest that the **Year 2 pupils were broadly positive about all of the aspects of their school and musical lives and that this positivity was maintained throughout the year,** with broadly similar mean

ratings given at post-intervention as pre-intervention. Concerning pupil's musical identity, learner identity and sense of self and social inclusion, matched pairs of measurements of the same pupil's questionnaire data indicate that pupils across all three subgroups of strings, vocal and drama continued to be positive.

The overall aim of the year-long Act, Sing, Play (ASP) programme 'was to evaluate whether music workshops had a bigger impact than drama workshops in terms of pupils' mathematics and literacy attainment'. The evaluation was based on a hypothesis that 'participation in high-quality music instruction promotes educational attainment over and above instruction in other artistic pursuits' (see Schellenberg, 2004) (NatCen, 2015, p3). Pupils in participant classes across 19 Primary schools were divided randomly into three arts intervention groups, two of which were music-focused (strings and voice), with the other group focused on drama (acting as a control). Each group had approximately n=10 pupils within each of the nineteen participant schools, with n=909 Year 2 pupils participating overall. An independent evaluation of the impact of the programme on mathematics and literacy attainment revealed no evidence that the ASP-music workshops had a greater impact than the ASP-drama workshops (NatCen, 2015). Nevertheless, the separate analyses reported here suggest that there was clear evidence of music learning in each of the two music-focused groups.

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Appendices

Appendix A: Practitioner activity observation schedule

School:		Year Group:	Teacher:					RO:					Visit:				
NSPR3 Pilot Observation Schedul	Code	Teacher Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A: The teacher plans effectively	A1	Recap previous lesson															
and sets clear objectives that	A2	Intro' learning objective (LO1)															
are understood	A3	Intro' learning outcomes															
	A4	Place learning in wider context															
	A5	Plan for learning needs of IEP pupils															
B: The teaching methods enable the	B1	Outline success criteria															
students to learn effectively	B2	Modelling and Scaffolding															
	B3	Sets challenging tasks related to LO1															
	B4	Shared thinking (teacher led)															
	B5	Explaining															
C: Questioning	C1	Questioning pupil - open															
	C2	Questioning pupil - closed															
	C3	Challenging higher order questions															
	C4	Uses questions to create dialogue															
	C5	No hands/brainstorm															
	C6	Wait time															
D: Feedback	D1	Relates L objectives to L outcomes															
	D2	Diagnostic feedback (oral/written)															
	D3	Time for reflection/review															
	D4	Enables peer assessment															
	D5	Enables self assessment															
E: Plenary	E1	Relate L objectives to L outcomes															
	E2	Asks pupils to discuss/demonstrate LO1															
	E3	Achievements celebrated															
	E4	Lesson placed in context for future/past															
F: Group size	F1	Group work															
	F2	Whole class teaching															
	F3	Individual work															
	F4	Paired work															
G: Singing/musical behaviours	G1	Singing															
	G2	Transmits enthusiasm															
	G3	Uses gestures to support singing															
	G4	Listening to singing															
	G5	Playing (note instrument)															
H: Classroom organisation	H1	Organising technology															
	H2	Organising staff															
	H3	Organising pupils															
	H4	Orgainsing room/furniture															
	H5	Dealing with pupil behaviour															

Appendix B: Pupil activity observation schedule

NSPR3 Pilot Observation Schedule		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
	Pupil Activity																									
P1	Attentive (static)																									
P2	Active Participation																									
P3	Imitating																									
P4	Questioning - peers																									
P5	Questioning - teacher																									
P6	Peer working (teacher led)																									
P7	Peer working (peer led)																									
P8	Shared thinking (pupil led)																									
P9	Shared thinking (teacher led)																									
P10	Independent working																									
P11	Leading/Demonstrating																									
P12	Reading																									
P13	Writing - copying																									
P14	Writing - creative																									
P15	Drawing - copying																									
P16	Drawing - creative																									
P17	Listening - to teacher singing																									
P18	Listening - to peers singing																									
P19	Playing (note instrument)																									
P20	Singing																									
P21	Composing/Improvising																									
P22	Requesting help (of teacher)																									
P23	Requesting help (of peers)																									
P24	Waiting																									
P25	Uninvolved/Onlooker																									
P26	Off task behaviour																									
	Other																									
	Other																									

Appendix C: Pupil questionnaire (all pupils)

Act *Sing* Play: All pupils *Autumn 2013*

Primary School:		Pupil Class Name:	
Pupil Initials:		Pupil Indicators:	
Pupil DoB:		Date:	
Pupil Sex:		Group:	D / V / S

Hello, my name is Jo and I am a researcher.

I would like you to complete this questionnaire. This is a list of statements that will be read to you. You need to decide if they are true or not. I will show you how it works. Remember, there are no right or wrong answers and you can always ask for help.

I would like to take part in the research today ☐ **Tick this box for yes**

☐ **Tick this box for no, thank you**

My name is _____

I am a girl I am a boy

My birthday is _____

Well done and thank you. Now, tell me what you think about the following statements.

1	I like going to school	
2	I sing at school	
3	I like the music that I play at school	

Appendix D: String practitioner assessment (string subgroup only)

Instrumental Tutor *Initial Pupil Assessment*

Pupil's first name:		**Tutor's name:**	
Pupil's last name:		**Date of completion:**	
Pupil's sex:		**School name:**	
Pupil's date of birth:		**Pupil's instrument:**	**Violin** **Cello**

After your initial meetings with this pupil, how would you rate their competencies or musical behaviours in relation to the following areas? Please indicate the level of competency demonstrated with a tick (✓) on the basis of your professional experience. Please complete for all statements.

	Not Evident						Highly Evident
	1	2	3	4	5	6	7
• **The pupil listened to music with concentration**	○	○	○	○	○	○	○
• **The pupil's comments demonstrated an understanding of the music played**	○	○	○	○	○	○	○
• **The pupil was able to recognise/discriminate between musical elements (e.g. pitch, rhythm, dynamics)**	○	○	○	○	○	○	○
• **The pupil was able to recognise when melodic or rhythmic patterns were repeated**	○	○	○	○	○	○	○
• **The pupil was able to make links between sounds and symbols**	○	○	○	○	○	○	○
• **The pupil was able to adopt an appropriate posture for playing**	○	○	○	○	○	○	○
• **Using the instrument, the pupil was able to produce sounds that were musical (e.g. tone quality, intonation)**	○	○	○	○	○	○	○
• **The pupil demonstrated physical co-ordination in relation to instrument specific skills**	○	○	○	○	○	○	○
• **The pupil was able to repeat melodic phrases on the instrument by memory**	○	○	○	○	○	○	○
• **The pupil was able to repeat rhythmic phrases on the instrument by memory**	○	○	○	○	○	○	○
• **The pupil was able to sing back a heard melodic phrase**	○	○	○	○	○	○	○
• **The pupil was able to listen, watch and respond appropriately to the playing of others**	○	○	○	○	○	○	○
Any other comments on the pupil's musical competencies or behaviours (please give a brief explanation in the box below) •	○	○	○	○	○	○	○

Appendix E: Vocal competency measure (vocal subgroup only)